VOLUME 14 #3 MARCH 1999 PRICE $6

EXPERIMENTAL MUSICAL INSTRUMENTS

For the Design, Construction, and Enjoyment of Unusual Sound Sources

HUMMING IN THE WIND

In China, since as early as the 10th century AD, people have made kites that sound in the wind. Two important types of singing kites are those that use small whistles or vessel flutes riding on the frame, and those with wind-sounded strings or ribbons stretched across an attached bow. A discussion of kite-flutes appeared in *EMI*'s September 1997 issue, with kite lover Uli Wahl describing them in buildable detail. Now, in this issue, Mitchell Clark describes the kind with strings or ribbons in an article full sound-kite lore and, of course, construction information.

Also in this issue we have Andy Cohen's chronicle of "the world's smallest grand piano," the Dolceola — a peculiarly tuned, keyboarded zither, played by, among others, the American blues musician of the 20s and 30s, Washington Phillips. We have an essay on the tactility of sound — sound as body-feel — from the infra-musician Monte Thrasher. We have a report on extraordinary architectural long-string installations from the Dutch sound artist Paul Panhuysen. We have Stroh violins, redesigned saxophones, children's instruments, bamboo instruments, a profusion of drums ...

...and, as always, much, much more. So open now, and read.

Above: Cigar Box Bass Guitar by Shane Speal. See more of his cigar box instruments on page 9.

IT AMAZES ME how every day we discover that there is very little new under the sun. I just read of the Aluphon built by Werner Raditschnig [*EMI* Vol. 14 #2, Dec. '98]. It was comical as after I met and worked with Harry Partch and Erv Wilson in the mid 60s, I built an instrument I call the *Aluminaphone*. It starts at *G* above middle *C* and has 35 tones per octave in a 3 1/3 octave range. It was made from the same conduit pipe you showed in the last issue.

An interesting thing happened to my wife and I two summers ago in Denmark (Copenhagen). We were walking on the streets and came across a museum of the most unusual instruments, We knocked on the door and asked if we could come in and the two woman curators told us that the museum was closed until the next day. We told them we were leaving the country the next morning and really wanted to see the instruments in the museum. Again they told us, "the museum is closed today but you are welcome to look through the library." While looking at the books the two curators brought over a copy of *EMI* and asked if we were familiar with the magazine? I said "YES and I believe my picture is in this issue!" When they saw my picture they opened the museum to us and we saw a display of ratchets from Italy that were incredible. Some were made in the shape of wheel barrels. We also saw a nail violin which was made in the 18th century. I had told Richard Waters years ago that there is really nothing new under the sun and I had showed him pictures of the nail violin years ago which was the predecessor of the Waterphone. [Editor's note: in both the nail violin and the contemporary Waterphone the sound comes from metal rods mounted at one end and free at the other, sounded by bowing.] I remember Harry Partch's answer when someone asked him how did he come up with something so new and unusual as his 43-tone instruments. His reply was, "I have not invented anything new but am just remembering something of the distant past."

It will be very sad to see *EMI* discontinued and wait for your plans for the future. Count me in.

— Emil Richards

I AM INSPIRED by two articles in your Dec.1998 issue (Vol 14 #1) to mention the Magic of the Amiga computer which emerged in 1985 and, until recently, was orphaned by several owners until picked up by Gateway Computers in 1997. The two articles are: "Motormouth" and "The Sub-Chant Generator."

Since its origin, the Amiga has been able to speak any text file with great clarity and output the audio via its on board sound chip. Pitch, speed, emphasis and sex are all controllable by way of a small program called the "SAY" command. In addition, sampled sounds can be intermixed via a "PLAY" command. This allows conversations, interviews and arguments to issue forth from the Amiga for fun and/or profit ?? All of this can be recorded on audio tape, in stereo.

Any reader interested in hearing the results need only send $20 and I will ship a tape with a variety of illustrative stuff.

More Magic... The Amiga operates at TV sweep rates, right out of the box, and can be recorded directly to video tape. It is the true multi-tasking computer and can do both the audio and video at the same time, including animation and all the things that the IBM compatibles could never achieve.

Want to see and here all of this ? Send $30 for a video tape... VHS, of course. Send $20 for audio or $30 for video and I will ship postpaid anywhere in US.

— Dwin R. Craig
6971 Rooks Ct., Frederick MD 21703
e-mail: dw1920@aol.com Voice:301-698-5269

In the Boxes on These Pages:

CHILDREN'S INSTRUMENTS FROM *BASH THE TRASH*

The very simple instruments appearing on these pages come to us courtesy of John Bertles and Bash the Trash, John's organization devoted to the making of musical instruments from commonplace materials with a special emphasis on classroom and educational use. Look to John's article "Beyond the Shaker," set to appear in *EMI*'s next issue, for thoughts on simple instruments and pedagogy, and look to the Bash the Trash Homepage (http://www.geocities.com/athens/acropolis.5732) for more instrument ideas.

4-IN-1 COFFEE CAN

Materials
Coffee can with lid
A small handful of rice or beans
Pencil

Procedure
Put the rice or beans inside the can and close the lid.

To Play
1. Shake it — it's a Maraca
2. Scrape the ridges on the sides of the can with a pencil — it's a Guiro
3. Hit the plastic lid with the pencil — it's a Drum
4. Hit the metal bottom with the pencil — it's a Steel Drum

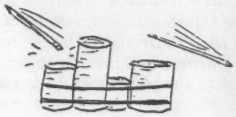
HAVING READ MITCHELL CLARK'S REVIEW of *Live with the Birds* of the Maciunas Ensemble and the Kanary Grand Band (Apollo Records ACD 129615), I feel called upon to make some additional remarks -- one of a technical nature, others in connection with the contents.

In the liner notes to this album a letter is quoted in which ensemble member Paul Panhuysen describes the circumstances of this sonic coming together. "The studio where the recording is made is the same room where the birds live in their aviary. The birds were so inspired by the sound of the aluminium strips, that they immediately joined the music as improvising musicians and continued to play with us in an often very loud and competitive way for more than an hour. The birds stopped only after we had stopped. The event was not planned, it just happened..."

The studio in which the recordings were made is a large space on the second floor of Het Apollohuis, the building where Panhuysen lives, works, and (until January 1997) presented exhibitions and concerts. In this studio he prepares and constructs the works he makes as an artist. As is stated in the quote above, it is there that Panhuysen's birds live, in an aviary. It was there that the Maciunas Ensemble convened on this specific occasion for making their music: sound explorations on specially devised instruments, often according to rules established in advance (see the liner notes to the first CD of the Maciunas Ensemble *Number Made Audible*, Apollo Records ACD 039211); all music is recorded, to be played back and used as a reference in discussions among the ensemble about the sonic results of their ideas.

The instruments used by the Maciunas Ensemble on that occasion were aluminium strips, not (as Mitchell wrote) wires. The confusion must have arisen from the pictures in the booklet which show the members of the group playing long strings. But then, the bell-like depth of sound that is generated by the ensemble is that of metal sounding bodies, not that of wires. And in fact, on an earlier page the setup is described: "Here, each Maciunas musician performs on an aluminium strip (about 200 cm long, 3

CAN DRUM SET



Materials
Tin Cans of different sizes
Tape
Pencil

Procedure
Tape the cans together with the metal bottoms facing up

To Play
Hit the metal bottoms with the pencil

Variation: Marching Drums
Tape or tie some string to the sides of the can drum set so that the student can wear the drums around his/her neck and march around with them

IN THIS ISSUE

EXPERIMENTAL MUSICAL INSTRUMENTS
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cm wide and 0.2 cm thick). The material is suspended from a rubber band which, among other things, allows for pitch shifting."

Birds that sing are alert to the sounds around them. The more complex their song, the more sophisticated they are in responding to such sounds. This is especially evident in species that use mimicking in their song, such as the Lyrebird, the Mocking Bird, and the European Blackbird Thrush. Other, less proficient, song birds may adapt to extraneous sounds by spacing their vocalizations around them — thus contributing to the complexity of a polyvocal chorus. Ornithologists have recognized this way of structuring songs only quite recently, because it comes dangerously close to (or perhaps even ventures into) taboo area, as it seems to suggest that in their song birds make conscious choices, thus transcending a dumb following of instinct.

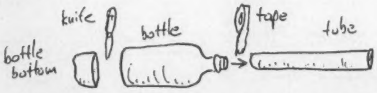
TUBE HORN

Materials

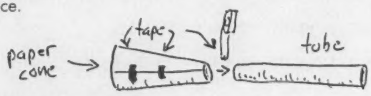
Cardboard tube - paper towel, wrapping paper, etc.
"Bell" (the funnel shaped thing at the end of a horn)—
EITHER 1. Soda Bottle
OR 2. Construction paper and tape

Procedure

1. Cut off the bottom end of the soda bottle with a sharp knife and tape it on to the end of the tube. Make sure the bottle top is off! OR



2. Shape the construction paper into a cone so that the small end will slip over the end of the tube. Tape it into place.



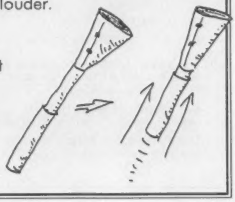
To Play

Brass instruments work by buzzing your lips. First, just practice buzzing your lips (hold your hand just away from your mouth so you don't spread germs). Then make a little tunnel with your hand and fingers and buzz your lips into the tunnel. You should get a nice, juicy "raspberry" or "bronx cheer" sound.

Now buzz your lips into the tube. The cone of the bottle or the paper should make it louder.

Variation

If you have another tube that fits snugly inside the other but still slides freely, then you have a Tube Trombone!



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To hear birds do this in their natural surroundings is wonderful — it is part of the beauty of the dawn chorus. But to hear them do it in a manmade environment and in a musical context is downright astounding. It is what happened when the Maciunas Ensemble played their aluminium strips. Incited by the complexity and richness of the instruments the birds in the aviary joined in. This is not entirely unheard of. Jim Nollman has played music to a variety of animals, stimulating them into response. In Afghanistan rubâb players often take a caged canary with them on stage; from time to time during the concert the bird will sing with the music — a pinnacle of aesthetic and spiritual beauty, according to the Afghan audience (examples of this can be found on *The Rubâb of Herat*, VDE-Gallo CD-699, recorded by John Baily).

Whereas Nollman has apparently tailored his music so as to secure a response from the targeted animals, what happened to the Maciunas Ensemble is more similar to the Afghan situation. There people will play their usual repertoire. It is the rich timbral resonance of the instrument, due in part to a considerable number of sympathetic strings, that sets the birds singing. But although this Afghan music and the bird's song may be directly related on one level, they exist side by side rather than interact. The Maciunas Ensemble however (who, like the rubâb players, did what they always do) established a reciprocal relationship with the birds through their music — unintentionally, but effectively.

Live with the Birds is based on the recording that was made of the event, represented by two long tracks in which the role of the two groups are reversed, as is expressed in the titles *Man and Bird* and *Bird and Man*. The reciprocality is manifested by the simple fact that either of both groups can take the lead, but also by the way the birds match their voices to the sounds generated by the Maciunas Ensemble. That is what makes this CD unique. The birds do actually play with the open and rich sound structures, fitting their warbles, chirps and cheeps to the pitches and rhythms coaxed from the aluminium strips. And they do actually take the musicians into new directions by the power of their presence.

These two tracks have insightfully been complemented with two tracks that feature both groups separately, allowing the listener the possibility to assess what one sounds like without the other — and through that, how their coming together (in effect a chance meeting) added something of unique significance to the repertoire of both. Only for the duration, of course; which makes the recording, to my opinion, even more valuable.

— René van Peer

NOTES FROM HERE AND THERE

In *Experimental Musical Instruments* Volumes 11 #3 and #4 (March and June 1996) we had a series of articles on the marketing of unusual musical instruments, and the question of how much commercial potential is to be found in the field. One of the articles in the series came from Dave Strohauer of Earthshaking Music. Earhtshaking was then a forward-lookng start-up specializing in the sale of exotic percussion, both experimental and ethnic, operating mostly by mail order. Since that time Earthshaking has continued to broaden its horizons. Dave recently sent this report.

HERE'S A QUICK UPDATE on Earthshaking Music. We've remained focused on providing unusual world music instruments and related recordings and instructional materials. However, the biggest development since I wrote the article is that we've left home (literally) for a real retail store front in a funky "transitional" area of Atlanta. Making this move has definitely brought us more exposure and more expenses, but I wouldn't go back to an in-home business at this point. I also feel strongly that starting at home was right for Lisa and me and Earthshaking Music.

While our focus is still clearly on world music, we have made "adjustments" in our product mix to better serve our neighbors. We now carry acoustic guitars, drums sets, and believe it or not, electric guitars! So far, though, we only carry the Danelectro line of reissued '50s guitars (sold as the Silvertone in Sears catalogs for many years). Who'd of thought? In closing, I should mention the Web, at least in passing. We've had a site up for about a year and a half now. All I can say is that I can't complain about (virtually) free advertising that runs 24 hours a day. It's generated steady sales in places I would never have imagined.

Anyway, thanks for *EMI*. I will sorely miss it!

Earthshaking Music can be reached at 1287 D Glenwood Ave, Atlanta, GA 30316; phone 404-622-0707 (ask for a free catalog); email erthshkn@avana.net or http://www.earthshakingmusic.com on the world wide web.

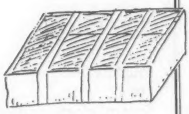
RICHARD WATERS is the inventor of the Waterphone and maker of many other exotic sound devices. After three decades making and selling the instruments, Richard is thinking of stepping aside from the commercial-production end of things. He'd like to speak with anyone who might be interested in taking over the business in full or in partnership. For details, see his notice in this issue's Notices column.

A NEW INSTRUMENTS AND INSTRUMENT-MAKING BOOK

Jay Havighurst is the author of the newly released *Making Musical Instruments by Hand*. The book includes nine detailed and carefully photographed step-by-step instrument-making projects devised by the author, plus nine complementary "galleries" — photo spreads of related instruments from a variety of makers. Included in the galleries are drums, kalimbas, spike fiddles, lyres, flutes and several other types, in an inspiring variety of shapes and forms, beautifully displayed. The author managed to find a refreshing mix of makers, including a few that might be familiar to *EMI* readers, and many more that will be new.

Making Musical Instruments by Hand is published by Rockport Publishers in Gloucester, Massachussetts, phone 800-289-0963. You can reach author Jay Havighurst by email at create@cove.com.

RUBBER BAND BOX GUITAR



Materials

Sturdy shoebox-sized box (styro-foam or corrugated cardboard is best, but a shoebox will work OK)
Rubber bands

Procedure

1. Wrap your rubber bands around the box (make sure the top is off). Be careful not to wrap so many around that the box collapses.
2. To tune your strings, stretch the rubber bands tighter or looser over the open top of the box.

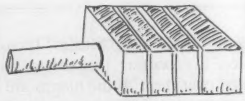
To Play

Just pluck or strum with your fingers.

Variations

Most children want to attach a tube to their box guitars to give the appearance of a guitar neck. While it doesn't in any way affect the sound, it does seem to make the instrument "cooler."

Either cut a hole in the end of the box of slightly smaller diameter than the tube and force the tape into the hole OR tape the tube onto the box. The former is studier, while the taping method is faster but prone to tape failure.



THE MUSICAL MUSEUM in Deansboro New York has recently closed its doors and auctioned off its collection. The museum, owned and operated by Arthur and Elsie Sanders since 1948, specialized in 19th century American automatic instruments and reed organs, and featured as well a wonderful variety of other musical specialties and oddities. Here at *EMI*, we can thank Art Sanders for connecting us with the early 20th century Deagan Organ Chimes set that got us started on a big organ chimes article (*EMI* Vol IX #2, Dec 1993) and the enjoyable series of exchanges on the subject that ensued in *EMI*'s Letters column.

The museum brought pleasure to many over the years, and a lot of people will be sorry to see it go.

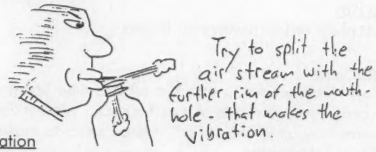
MORE SPEED BUMPS: In *EMI*'s June 1995 issue (Volume 10 #4) we had an article from our regular contributor Mike Hovank-

BOTTLE FLUTES

Materials
Tape
Several plastic soda bottles of different sizes

Procedure
Tape the bottles together in a row from smallest to largest with the open mouths facing up.

To Play
With your bottom lip lightly touching the mouth of the bottle, blow over the mouth of the bottle so that some air goes into the bottle and some over it — this may take some practice!



Variation
Turn the set of bottle flutes over and hit them on the bottoms with a pencil. They become a nice drum set.

sek on "Speed Bump Music." If cross-wise grooves or ridges are placed in a roadway, then drivers will hear a noise as their wheels bump over them. If the bumps are closely spaced, the bumping frequency may fall within the hearing range and drivers will hear the corresponding pitch. If more widely spaced, the bumps will come across as a rhythm pattern. (Traffic engineers sometimes deliberately incorporate such bumps into roadways as an audible warning to drivers who might be speeding or straying from their lane.) The idea in Mike's article, put forth to him by his friend Tim Buckett, was that one could, by laying out suitable spacings, program a series of speed bumps for any number of different sorts of pitch or rhythm relationships, and give the drivers a totally unexpected sound experience. The article inspired a series of letters to the editor, with readers describing their different ideas or experiences along these lines. Now here's one more addition: An article by Michael Colton appearing in *The Washington Post* of Oct 1, 1998, called "Music of the Streets" describes a street-music project called *Loci*, made by Alberto Gaitan. Gaitan stretched rubber hoses across a suburban street in Arlington, Virginia, spaced in such a way as to create a drive-by rhythm. The article emphasizes the hoped-for effect of the rhythm on the mood of the drivers, as an antidote to road rage or a call to present awareness for commuters preoccupied with the day's business.

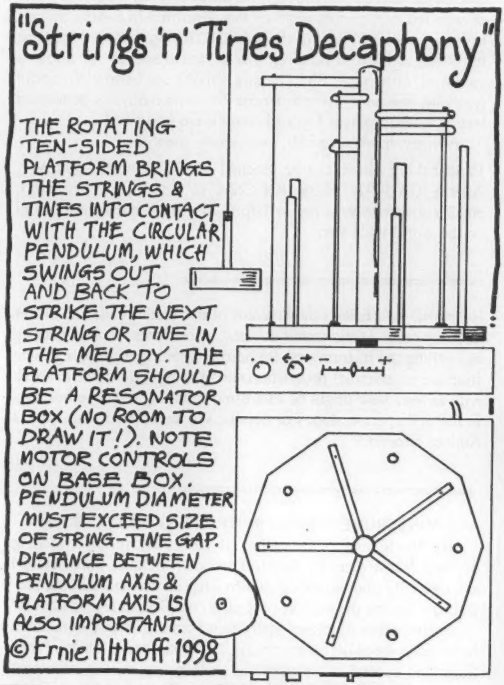
ENCLOSURES: A Multimedia Portrait of the Unconventional Life of American Composer Harry Partch

Recent years have seen increasing recognition for and elevation of the work of Harry Partch (1901-1974). Partch was the composer known for, among other things, his pioneering work in non-standard scales systems, and the orchestra of new and highly inventive instruments created in support of those systems. He also was an iconoclast, an autodidact, a rugged individualist, a complete one-of-a-kind; all-in-all, one of the century's extraordinary figures.

Innova Recordings, the label of the American Composer's Forum, has been releasing a substantial body of Partch's work under the name *Enclosures*. The series is the culmination of a 13-year endeavor by the composer and scholar Philip Blackburn. Five publications in the Enclosure series have now appeared, including two VHS videos, two multi-volume CDs, and a large limited-edition book chronicling the composer's life through photos, letters, lectures, sketches, drawings, reviews and other archival documents. For information on the series you can visit the Composers Forum web site at http://www.composers-forum,org, or contact Innova Recordings at 332 Minnesota St., E-145, St. Paul, MN 55101-1300; phone (651) 228-1407.

ONE MORE TO GO!

EMI's next issue, to be dated June 1999, will be our last. Remember, though, that even after the magazine stops, other facets of *EMI*'s operations will continue. The great majority of the materials we've produced over the years will remain available, and we even hope to expand our operations in some ways. You'll be able to keep up with our activities through the *EMI* web site at http://www.windworld.com/emi (which we hope to do a better job of maintaining in the future).



Above: Another in a series of possible instruments by Ernie Althoff

AND BEYOND: A few people have expressed an interest in creating a new publication (probably online) to carry on where *EMI* leaves off. If you think you might like to join in the work of bringing such a thing to life, contact James Coury at (360) 943-3984; email James@artsonic.com.

WHERE TO FIND LES PHÔNES: In the recently released book-and-CD set *Orbitones, Spoon Harps & Bellowphones* from *Experimental Musical Instruments* and Ellipsis Arts, we provided insufficient credit information for one of the included recordings. Here's the full information (it will be on *EMI*'s web site as well):

The recording is track 7 on the CD, containing two pieces from the group Les Phônes. "La Dance des Fourmis" is taken from the CD *Mythes & Légendes Phônes*, recorded by Bruno de Chénerilles, on Audiorama Records. The second piece, "Live 97" was recorded by Benoit de Clerck. Produced 1995 Les Phônes SABAM.

For the Audiorama CD, you can contact Audiorama at BP161, 67004 Strasbourg cedex, France; tel/fax : 33 (0)3 88 61 21 29; email audioram@club-internet.fr; or visit http://perso.club-internet.fr/audioram on the web.

It's a shame that we will never have had a full article on Les Phônes in *EMI*. Theirs is a fascinating world in which, through cleverly conceived and carefully designed acoustic instruments, body movement and dance are realized as music. The *Mythes & Légendes Phônes* CD is highly recommended.

In last issue's article "Hybrid Winds" by Linsey Pollak, we somehow neglected to give Linsey's address for readers who might want to contact him. Better late than never — here it is: Linsey Pollak, Kin Kin Rd., Queensland 4571, Australia; phone 61 [for Australia] (0) 7 5485 4343; fax (61) (0) 7 5485 4463.

As *Experimental Musical Instruments* approaches its last issue, uncommitted space for new articles in the few remaining issues has dwindled to nothing. But, of course, worthwhile new article topics continue to come our way in as much abundance as ever. As a result, we've had to say a regretful no to many promising article proposals in recent

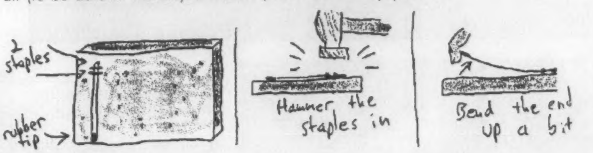
FINGER PIANO

In Africa, finger pianos are also known by the names *sensei*, *m'bira*, and *kalimba* among others. Here is how to make your own.

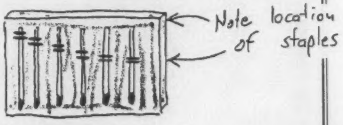
You will need:
Bobby pins (large ones work best but you can use both large and small)
Pliers (to break the bobby pins)
Heavy duty staple gun and 3/8-inch heavy duty staples
Plywood (about 6 inches by 6 inches and at least 1/2 inch thick)
Hammer

Step 1:
Break three bobby pins by putting the bent part in the jaws of the pliers and crushing them down. As you open them up again the metal will snap (Note: if you don't have pliers you can also break the pins by hammering the bent part flat with a hammer). If you broke three pins you should now have six pieces, each with a rubber-tipped end and a rather sharper metal end.

Step 2:
The low pin. Staple a pin to the left side of your plywood. Use two staples positioned right at the sharp metal edge of the pin to leave the rubber tipped end free for playing. If the staples did not go all the way in, then hammer down the staples to hold the pin tightly. The rubber tipped side should be up in the air (to be able to vibrate). If it is not, then bend it up just a bit.



Step 3.
The rest of the pins. Start stapling in the rest of the pins. As you work your way from left to right, staple the pins further and further toward the rubber tips, so that the length of the vibrating pin is getting shorter and shorter. You probably shouldn't staple the pins any further than halfway down the length of the pin.



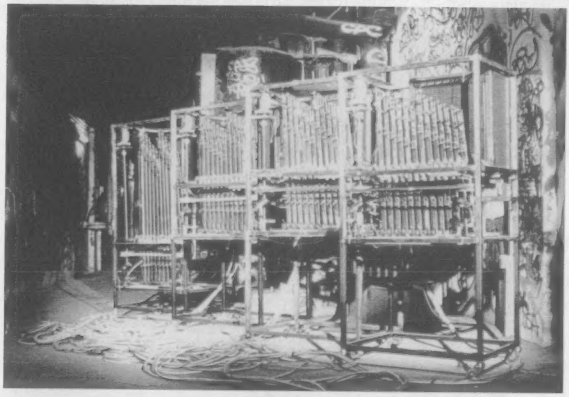
To Play:
Push down on the rubber tip then slide your finger back off the tip. As the pin bounces back to its original position it will vibrate and make a sound. Try putting the plywood on different things to make it louder (something called a resonator). The best things are big cardboard and styrofoam boxes, but try any thin rigid flat surface to see what works best!

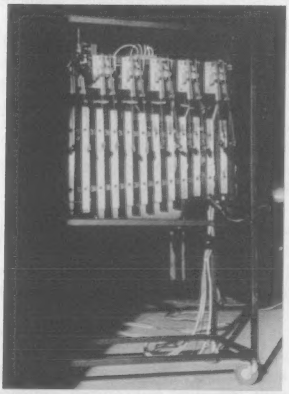
months. But we have been able to slip a few topics in the back door, as it were, by including relatively short reports here in the "Notes From Here and There" section. This way of presenting the material isn't as good as a full-length article, but it's better than nothing. So you may have noticed that the "Notes From" sections in these latest issues have been particularly full of good stuff. A couple more of these short reports — distillations of articles that should have been — follow here.

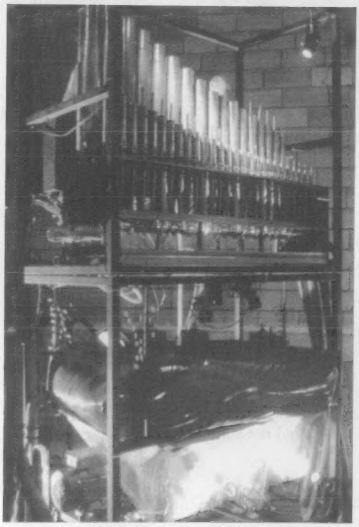
JACQUES RÉMUS AND MÉCAMUSIQUE

The French musician and instrument maker Jacques Rémus specializes in automataphones — self-playing acoustic music machines operated by combinations of pneumatics and electronics, controlled by computers using MIDI code. The instruments include winds (organ-like assemblages of tuned pipes), plucked or bowed strings (sounded by rotary bows or plectra), tuned percussion (tuned metal tube sets) and untuned percussion (bass and snare drums augmented with maraca and other sounds). Jacques is, in his words, "fascinated by the parallelism between music and mechanics," and finds a strange friendliness and an unexpected depth and emotion in the sounds of the machines. An informational booklet on his work that he recently sent us enlarges on the theme:

"Originally a biologist, Jacques Rémus left submarine labs in the early 70s to dedicate himself to music and to explore a variety of performing art media... Seduced by the magic universe of automataphones, he orchestrates a marriage (obviously of passion) between industrial robotic, computer-controlled music,







AUTOMATIC INSTRUMENTS FROM JACQUES RÉMUS

Upper left. Automatophonic plucked strings: Double bass, cello, bass and treble mandolines.

Photo: Denis Chapoullié

Upper right. Percussion: a tuned metallophone tube set

Photo by Denis Chapoullié.

Left. Winds: Jacques Rémus' orgue aigu.

Photo: Gil Lefauconnier.

Right: Jacques Rémus with his grandfather's violin seated in the "arms" of one of the *Double String Quartet* musical machines (which is a cello double mono-string instrument).

Photo: Fabrice Deguy.

mechanics and instrument craft. Today his 'family' includes about twenty big-sized robots which, interacting with a computer or a musician, set in motion their jacks, piston, gears and other crankshafts and bring to life a vibrant visual and aural setting with a repertoire of classical and modern 'hits' or original compositions."

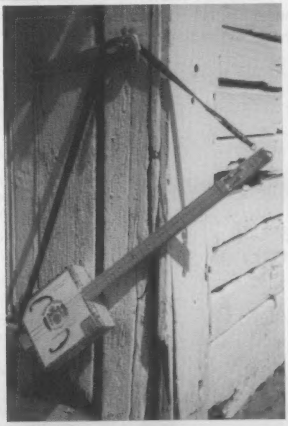
Working with Sylvain Aubin, Jacques has also joined in the development of the Musical Camera, a system for translating a performer's movements in space into music. In this system, a video camera trained on the performer sends the resulting signal to an electronic control unit which translates the signal into a digital data stream. The data goes to a computer running a special program developed at IRCAM (the Acoustic Music Coordination and Research Institute in Paris) which maps it into musical patterns to be played by MIDI-controlled instruments. The performer can be anyone; no training required.

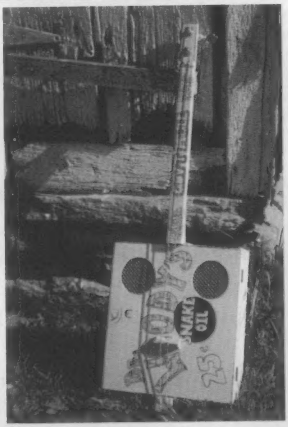
Jacques Rémus has made Mécamusique installations over the past eighteen years throughout Europe and in Canada, Africa and Japan. His sampler CD *Les Automatophones* reveals a musical vocabulary that is at the same time pretty, spicy, quirky, thoughtful and funny. Jacques can be reached through IPOTAM at 91, Quai Panhard et Levassor 75013 Paris, France; phone/fax 33 1 45 82 84 40; world wide web http://inforoute.capway.com/remus.

CIIGAR BOX GUITARS FROM SHANE SPEAL

None of the major musical instrument encyclopedias have an entry for cigar box guitar or banjo. Yet most people have at least some familiarity with this facet of American folk history. At a time when many a hillbilly or sharecropper musician would have lacked the funds to buy a commercially made guitar or banjo, cigar-box instruments often filled the need, providing a substitute that was functional, affordable and easily home-buildable.

The idea behind cigar box instruments is to take the lightweight wooden boxes that normally serve for storage and sale of cigars, and use them as readymade sound boxes. Typically, the most effective way to add a neck to the box is spike-fiddle-fashion: run the wooden plank that serves as the neck all the way through the box so that it protrudes a bit at the lower end. The strings are anchored there at the lower end. This way, the neck plank does the work of supporting the string tension at both ends, minimizing stress on the box. The strings pass over a bridge on the soundboard (the top of the box), pressing down on it to transmit their vibrations. Ideally, the portion of the neck plank passing under the soundboard is routed out or otherwise lowered a bit so that the top doesn't rest directly on the neck plank (which would inhibit vibration). Traditionally, the neck has no raised frets, although it may have fret markers drawn in as visual guides.





CIGAR BOX GUITARS BY SHANE SPEAL

Above left: Shane plays a cigar-box guitar made from a Macanudo Portafino-Café cigar box, using a 3/4" wrench socket for a slide.

Above center: The precious cigar-box guitar #56, Shane's preferred performance axe.

Above right: A 2-string bass guitar using an oversized "Wine Gift Set" cigar box, custom made for Allen Woody, formerly of the Allmen Brothers.

Right: Left to right: Warren Haynes, Matt Abts and Allen Woody, members of the group Gov't Mule, with cigar box guitars by Shane Speal.

In this respect the old instruments show a kinship to the early American fretless banjos. The number of strings varies -- three might have been common — and wooden friction pegs for tuning would have been the norm.

Wooden cigar boxes may not be as commonplace now as they once were, but they can still be found. Shane Speal, musician and maker in Pennsylvania, managed to gather enough boxes to make something over a hundred and fifty cigar-box guitars between 1993 and 1998. Working under the name Catfish Musicworks, he produced them for sale, for give-away, and for his own enjoyment. Shane's typical instrument has three strings, and has fret position markers burned into the neck. Metal bolts serve for the bridge and the nut. In a concession to convenience and dependability, he has updated the instrument with modern worm-drive tuners. Because each cigar box is different and has its own characteristic resonant properties, each guitar has its own musical personality.

For his own music, Shane favors blues and bottleneck guitar styles, noting that cigar-box guitars served as starter instruments for many of the older-generation bluesmen. He now no longer produces the instruments in quantity, focussing instead on bringing the culture of the instrument to people through his own performances and an upcoming album. The as-yet-untitled album, set for release this spring, relies heavily on his homemade creations along with an array of washboards, gut-bucket basses, tenor guitars and banjos, plastic ukes and standard guitars. "My music falls somewhere between Blind Willie Johnson and Spinal Tap," Shane says.

Shane Speal can be reached at Catfish Music Works, 300 Horace Mann Ave., Red Lion, PA 17356.

WEB SITES OF INTEREST

Here's this issue's listing of web sites relating to unusual musical instruments. Many more are listed in previous issues of *EMI* and on the links page of our own web site at http://www.windworld.com/emi. In addition, please take a look at Glenn Engstrand's "Site Check," next page.

Echo City (London music group specializing in inventive instruments, sound installations and sonic playgrounds): http://www.echocity.demon.co.uk

David Woodard's article on the feraliminal lycanthropizer, a low-frequency wave generator said to induce strange, animalistic behaviors in people within hearing range: http://www.davidwoodard.com/feral-index.html

Chrysalis Guitars (highly innovative designs including ultra lightweight grillwork body structures supporting an inflatable membrane serving as the sound radiating surface): www.chrysalisguitars.com

Whistlers (naturally occurring very low frequency radio signals): http://www.triax.com/vlfradio/vlfhndbk.htm

Mark Hawley's kalimbas: http://www.hometown.aol.com/kalimbas

Ernst Zettl's virtual violin (a computer interface by which string-playing techniques can be translated into MIDI information): http://www.music.privateweb.at/wkm/

An account of extraordinary sound reflection effects in a Mayan temple: http://www.newscientist.com/ns/981010/npyramids.html

The Improvisor, journal of free improvisation — newly built site at a new address: http://www.the-improvisor.com

Ragtime Automated Music — automated musical instruments in the tradition of band organs and orchestrions, but using MIDI control systems and some not-so-traditional acoustic sound sources: http://www.ragtimewest.com

Text on and some great pictures of the early talking machine created by Wolfgang von Kempelen: www.ling.su.se/staff/hartmut/kempln.htm

Tarogato (the Hungarian sax-like woodwind): http://www.ucolick.org/~sutin/tarogato.html

Gourds and gourd instruments: http://www.net22.com/qazingulaza/inventedinstruments.html

Dale Wisely's tin whistles site: http://www.chiffandfipple.com

Bamboo crafts featuring wind instruments from Ángel Sampedro del Río: http://www.usuarios.arnet.com.ar/bambu/

The botar, a computer-controlled guitar-like instrument from Tom Newman: http://www.pobox.com/~tan/botar

Teuffel Guitars (electric guitar-like instruments with several unusual features: http://www.salwender.com/teuffel1.html

Stanford University Center for Computer Research in Music and Acoustics, including the Musical Acoustics Research Library (MARL): http://www-ccrma.standford.edu/ccrma/

SITE CHECK

This is the third in a series on Internet resources for experimental musical instrument inventors. The last article featured instructional web sites. The final article will review various sites that focus on the theory of experimental instrument design. This article discusses other resouces on the Internet in which you can seek out and find web sites yourself. Below, you will find *EMI*-centric tips for how to use the various search engines, links pages, list servers, and the Usenet for your own research.

SEARCH ENGINES provide a keyword-based approach to finding web sites. You type in a keyword or phrase and you scroll through pages and pages of lists that link to web pages that contain what you asked for. The most effective way to use this type of resource is to word your request very carefully. Be careful of what you ask for as you just might get it — all ten thousand pages of it.

http://www.sirius.com/~touchles/emi/outside.htm
Most search engines are general purpose. You end up with a gazillion links and 99% of them don't really have anything to do with what you want. This search engine is focused exclusively on experimental musical instruments. If anything, it is too exclusive.

http://www.dogpile.com/
This is a meta-search engine. It takes your search string, formats it correctly and fires it off to other search engines. The resultant list is pretty well organized and lets you choose how to navigate through the results in a fairly smart way.

http://www.askjeeves.com
This is a meta-search engine that also does some Artificial Intelligence to figure out what you are seeking. The AI part is kind of hit-or-miss right now but expect it to improve with time. The meta-find part has some excellent intelligent filtering.

LINKS PAGES are basically pages that contain links to other pages. Many of the web sites devoted to experimental musical instruments also contain a page that links to other sites of similar interests.

http://www.nerdworld.com/nw481.html
Has links to more or less the same pages that these other URLs link to but this one is well organized.

http://www.usd.edu/smm/links.html
Large list covering music instruments in general.

http://www.users.zetnet.co.uk/ross/flutes/resource.htm
Pretty good links pages for flutes

http://www.arachnaut.org/music/links.html
Large page of electronic music links. Not actively updated but still very useful. It has a goofy-sounding MIDI file embedded in it.

http://www-math.cudenver.edu/~jstarret/microtone.html
Links to microtonal music resources.

http://www.music.indiana.edu/music_resources/research.html
List of lists for music research databases.

DISCUSSION LISTS use another Internet resource, email, to disseminate information. You subscribe to a list server. You will start getting email from that list server. Anytime you email to the list server, your email is forwarded on to everyone in the list. The idea here is that people of similar interests will subscribe to a particular list, forming a forum of discussion for that intended topic.

http://www.lancs.ac.uk/users/music/research/musical-lists.html
Details various musical discussion lists.

http://www.deeplistening.org/deepl.html
Instructions for how to subscribe to the Pauline Oliveros deep listening email list.

http://www.onelist.com/viewarchive.cgi?list-name=oddmusic
This is a registered mail list for odd musical instruments. You can lurk without registering.

USENET NEWS GROUPS are very similar to email lists but there is one key distinction. You use your email software to read postings from an email list and they get mixed up with the rest of your email. A Usenet news group is read with special software called a news reader. Both Internet Explorer and Navigator come prepackaged with their own news reader software. You will also need to access a news server. Your ISP can provide you with the URL to your news server. http://help.mindspring.com/modules/00700/00735.htm is the URL that shows MindSpring users how to connect if they use Internet Explorer.

rec.music.makers.builders
Mostly for Luthiers. About a half dozen messages a day.

alt.music.makers.theremin
Did that get your attention? Actually, there are about a half dozen newsgroups under alt.music.makers and about the same number in the rec.music.makers newsgroup. Most of the traffic on these newsgroups are more for players of various instruments than they are for makers of the instruments. It's still worth a look, though.

http://orpheus.ucsd.edu/music/lists.html
List of lists of list servers and Usenet newsgroups.

http://www.rogo.com/folkstuff/rmmbFAQ.html
Many news groups also publish a FAQ which is short for Frequently Asked Questions. These FAQ documents can be most helpful. This URL takes you to a copy of the instrument builders FAQ.

POLYMORPHOUS PERCUSSION CONSTRUCTION

Making Drums out of Everything in Sight

By Zeno Okeanos

Zeno Okeanos plays the *sartenes*. Steel frying pans are lighter and sound better than cast iron.

First, it was seeing Spike Jones at the Pan Pacific auditorium in the late forties. Then, I still have vivid visual recollections from Roy Harte's Drum City in the 1950s, visiting the home of the late percussion collector and author Dr. Joe Howard, photographs from numerous books including *Los Instrumentos De La Musica Afrocubana* by Fernando Ortiz, Emil Richard's *World Of Percussion*, *Genesis of a Music* by Harry Partch, various books and articles by Harold Courlander, and the 1940s photographs of Earl Leaf's West Indian travels as they appeared in Marshall Stearn's *Story of Jazz* and Earl Leaf's *Isles Of Rhythm*. Fueled by the earliest of these images and a desire to play along with the then-novel themes from the "I Love Lucy" show and the 1950s Perez Prado TV show, with all the ingenuity of my eleven-year-old mind I searched the barren landscape of mid-fifties Los Angeles suburbia for anything to make a bongo-type drum and a metallic clunk like a cowbell. This started my do-it-yourself obsession, searching for the percussive potential of everything in sight. I would like now to pass on some of the handy hints I have discovered along the way.

My first drum was made from a very small pine barrel that contained Mission Pack Brandied Dates. I remember waiting impatiently for the family to finish eating these things so I could apply a head of scrap leather with carpet tacks. Somehow I knew to wet it first when applying the head and later discovered it could be tuned up in front of the bathroom heater, a tiled room in which it sounded particularly dramatic. Mostly I practiced next to a very noisy and rhythmic Bendix washing machine, best when the load was out of balance. Then it bumped and danced, shook the whole room, and sounded to me like a whole battery of African drummers, a sound then known to me from the underscores of all those Safari films that were a staple of 1950s TV fare.

Many years later I developed a convenient hardware tuning system for most drums with animal skin heads. This system involves two butt-welded (1/8-1/4") round-stock rings preformed by hand around any convenient circular object of appropriate diameter (sometimes the drum itself), brackets cut from angle stock, drilled and painted, tuning lugs made from long carriage bolts, heads cut off and bent into shape with vise and hammer. [photo #1] The tuning lugs hook directly over the top ring which is either painted or wrapped with decorative adhesive gauze, the kind used for wrapping the handles of tennis rackets. When making drums from wooden barrels it is sometimes advisable to bolt each stave to one or more of the barrel hoops to keep the staves on which the brackets are attached from being pulled upward into the head by the tuning hardware. Although more difficult, another solution to this problem is to edge-glue all the staves and then reassemble the barrel.

I have used this tuning system on wooden barrel drums, fiber barrel drums (on which it is necessary to add metal reinforcing strips along the length of the barrel), boo-bams (balimbafon) made from 4" ABS pipe and their couplings, a large aluminum kettle, and PVC drums made from large diameter recycled water-main scraps. [photos #2, #3 & #4] PVC is easy to cut, drill, or rasp with woodworking tools. Pre-drilled holes can hold screws. Uneven rough ends can be squared off by wrapping and lining up a wide roll of paper around the circumference, taping in place, then marking the cut along the edge of the paper with a felt-tip pen. PVC can be cleaned with acetone, stained with acetone into which color tints have been added, or painted with anything, if first primed with white pigmented shellac.

The story is that Afro-Cuban dock workers improvised Rumba (*Yambu*) on wooden boxes. Sitting on a large empty wooden codfish container, one drummer played the sides of the box for a bass sound (*tumbao*) while another drummer used a much smaller and higher-pitched candle box for the lead part (*quinto*). A couple of metal spoons conveniently transported in a pocket came out and a third participant tapped out a *palito* pattern on another wooden surface or the same codfish box. Add singing, maybe a clavè player, and a beautiful musical dance tradition was formed. The wooden head Cuban instrument which evolved from this is known today as the *cajon* (box or drawer) and was consequently

Photo 1. Detail of all-purpose tuning system with carriage bolts, angle stock, and round stock.

Photo 2. Various barrel drums utilizing simple tuning system. Played with hands or sticks.

Photo 3. Boobams made from 4" ABS pipe and whole couplings. Tonality is almost entirely determined by pipe lengths. This design was found to be more practical than the one suggested in *Sound Designs* by Banek & Scoville, a good source for pipe lengths.

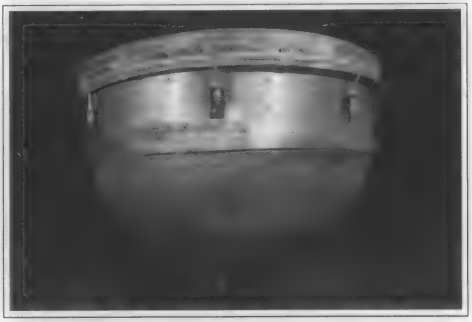


Photo 4. A recycled aluminum kettle from the junkyard makes a resonant 30" diameter drum. A large empty fiber barrel is used as a stand. It can be played by several drummers at the same time.

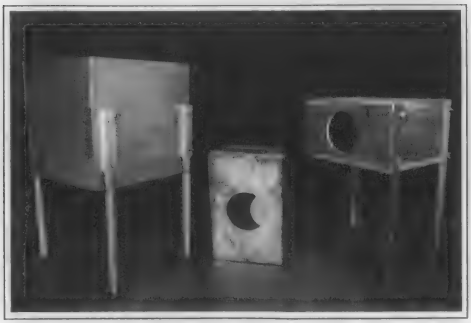


Photo 5. Cajons made from found boxes. Legs make them easier to play alongside congas.

Photo 6. Home made cajons along the lines of Cuban designs.

borrowed by Flamenco music and also some South American musical forms and now the rest of the world. Once I developed a taste for the somewhat amorphous and "crunchy" sound of the cajon, I found myself playing everything in sight: wooden doors, table tops, desks, cars (the tops and hoods; not just the dashboards), cardboard boxes, plastic buckets, books, canned goods, magazines, a loose piece of paper lying on the carpet, the top of my head, etc. All beautiful and usable. Well, maybe not my head.

The best material for the head of a cajon is very thin (1/4-3/8") plywood sometimes called door skin. Recycled interior decorative paneling works fine rough side out. The door skin can be applied by simply gluing it to the shell or box with carpenter's glue. A better method is to run a silicon bead on the bearing edge and then fasten the head with small finishing nails along the perimeter. Pneumatic staple guns also work quite well. It is possible to have two opposing heads on a cajon. If, then, the bottom of the box is not open, there needs to be an aperture somewhere in the system. Although not preferred, one of the heads could have the aperture. For larger heads, the slightly thicker ply works better. The larger bass cajon, which is sturdy enough for the player to sit on, typically has two opposing heads of slightly different size, both of which are played. For some found boxes a few obvious wooden reinforcements should be added in order to stabilize the box or add more nailing surface to the bearing edge. For medium-size cajons, ready made wooden table legs with added rubber feet can be attached if the player chooses not to hold the box between the knees bongo-style while playing. A metal snare can be pop-riveted to the underside of the head for an interesting variation. I personally prefer a trimmed down half of a snare. I have made these instruments from custom formed plywood tapered shapes, found barrels, boxes, wooden buckets of all types, and large PVC pipe which requires screws and pre-drilled holes. Hardwood garden containers available in several sizes are a ready- made source for shells. They are somewhat lighter and less cumbersome than the cut down recycled oak wine barrels sometime used for the same purpose. [photos #5, #6 & #7]

An *udu* drum (African) is basically a hollow ceramic sphere or vessel with two holes in it each about 2" in diameter. You hit one hole with your palm, fingers, or a special paddle and alter the tone by simultaneously manipulating the second opening with your other hand. To make udu drums the hard way, I gathered together various found objects: Bowling balls, spherical lamp fixtures, cups, drawer pulls, etc. and using modeling clay I assembled these into the desired shapes for various sized instruments. In the manufacturing process plaster break-away molds were formed around these objects and from these molds hollow ceramic instruments could be mass produced, then glazed and fired. After making a few prototypes the project was abandoned. [photo #8]

The udu drum is distantly related to the Indian *ghatam*, the American "jug", and the Cuban *botijuela* (*botija*, *bunga*) which was originally fabricated by adding a hole to the side of a large ceramic bottle used to ship oils. Although the botijuela was mostly used as a breath-activated bass in *son* music, the Cubans sometimes played it percussively with a paddle, especially the ones that were made of wood! Imagine a tight wooden box entirely closed except for a 2" hole, possibly a second hole on the side. This rare idea was depicted in Ortiz. Bamboo is another possibility. Actually any ceramic vase, figurine, jar, or bottle will produce some interesting tones even with only one opening. Thin-walled ceramic figurines with about a one inch hole in a flat bottom work quite well when you strike half-hole and quarter-hole tones with your fingers. To the casual observer you may appear to be a collector of some very 'kitchy' objects. The easier way to make an Udu drum is to become a ceramicist or know one. My advice is to contact Earthtone Drums in Sebastopol California.

The fastest and simplest way to make a bell with a sound similar to a cowbell is by pinching the end of a length of large-diameter (2" or 3") copper pipe most economically obtained at a scrap yard. I do this in a vise. By experimenting with various lengths it is possible to make a 'tuned' set. I rivet or bolt a couple of machine screws through the flattened end to keep them from buzzing. This is also a good place to bolt the bells for mounting. [photos #9 & 10] I have also assembled a life-time collection of actual cow bells (clappers removed) on a rack with three systems of color coding to indicate different approximate scales. [photo #11] At one time there was a company which sold a tuned set of cowbells, however, I have not seen one since the days of Spike Jones. I like to use serendipitous scales.

The *berimbau* is a single-string musical bow from Brazil, with a single gourd resonator attached, played percussively with a small stick. The flexible hardwood limbs suitable for making an authentic berimbau can only be found on the Biriba tree in Brazil (Bahia) I am told! The Cubans made a similar instrument called a *burumbumba* so I assume the tree grows there. I bet there was suitable wood in mother Africa as well. I like a challenge. What I have come up with, so far, is 1/2" metal electrical conduit pipe called EMT (thin wall). In lengths of 5 to 6 feet this material works just fine. On one end I put a short 90 degree bend using a conduit bender. The piano wire is mounted to bolted screw eyes. At the lower end a small to medium turnbuckle is incorporated to adjust tension. [photo #12] Typically, in the berimbau, the gourd resonator is held by a short piece of twine looped around both the wire and stick and tied to the flower end of the gourd through two small holes. The gourd and loop can slide up or down on the wire for fine tuning. Sometimes the gourd is permanently fastened to the stick in the appropriate position. I find it a somewhat awkward instrument to play since the hand that holds the stick must also hold a round stone, coin, or round piece of metal which can press up on the wire while the other hand both strikes the string with a bamboo stick and simultaneously holds a shaker called *caxixi*. This creates two main tones. Slight modulations are then added, as well as subtle percussive effects. Generally there are three sizes corresponding to soprano, tenor, and bass. Since a group of these instruments are played to accompany *capoeira*, a spontaneous trance-inducing street 'ballet' between two men in mock, gymnastic-like, ritual combat, they are built to be portable. Away from this context many freedoms can be taken with the concept, basically a percussive monochord (related to the *ektara*, *tuntina*, *oop gopi*, tin-can phone, etc.). First of all, the gourd resonator can be permanently mounted anywhere along the pipe to achieve its function as amplifier. Alternate materials may be utilized for the stick. Also, more than one gourd resonator can be employed for extra volume. This tends to sacrifice one of the traditional functions of the gourd which is to modulate the tone or effect a tremolo as the player pushes and pulls the open end against his stomach. I have seen recent innovations which physically join two sticks in tandem, each with its own gourd resonator, thus giving a solo player even more tones. Why not a whole bank of them incrementally sized, each with their own resonator? The ideas just keep flowing and evolving, I have to work fast to keep up with them.

Photo 7. Cajons made from found wooden buckets.

Photo 8. Ceramic udu drums and remnants of aborted attempt to become the first U.S. manufacturer circa 1970s.

Photo 9. Bells from copper pipe. Tuning requires cutting, squeezing, pinching, pushing, and pounding until you get what you need.

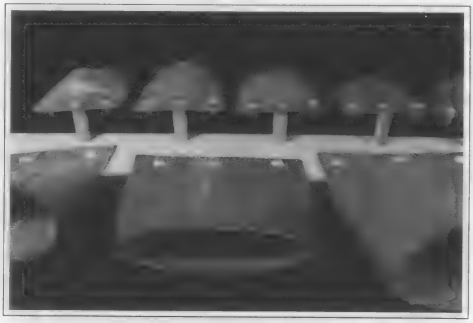


Photo 10. Detail of copper bells made from 2" and 3" pipe. Round-head mallets play serendipitous scales.

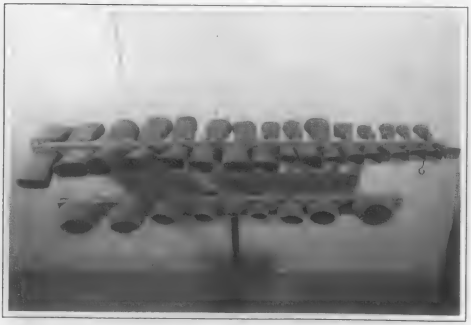


Photo 11. Twenty-year collection of actual cowbells. Cannot now locate cows.

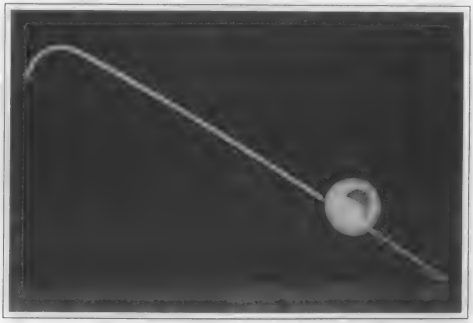


Photo 12. Berimbau from EMT 1/2" pipe. What could be easier?

I have made an interesting variation of the berimbau out of some discarded laminated hardwood skis. Since I do not play it in the traditional context I have mounted two gourds at the upper end where they are out of the way for a different style of playing, or skiing for that matter. [photo #13]

I have also made a monochord by suspending a piano wire inside a length of ABS 4" pipe mounted on a rigid beam. A section of the pipe is cut out at the center for access to the string which I like to play with two chopsticks (traditionally only one hand is available for striking the berimbau). At the ends of the pipe there are bucket resonators into which threaded ABS plastic plugs (1½") can be tightened. A female adapter is mounted through the end of the bucket. Tension is achieved by screwing the plugs into the buckets. The wire is fastened through a small hole in the knob of each plug at a critically determined length. There is a notch at either end of the pipe into which a wrench can be fitted for tightening the plugs and thus the tension of the wire. The wire tension holds the buckets in place at the ends of the pipe. The combination of buckets and pipe makes for a very effective resonator. Empty five gallon plastic utility buckets minus their handles work fine, although a large metal can would also work. Make a precise hole in the center of the bucket bottom with a drill or electrician's hole punch, then cement the plug adapter to the coupling on the other side of the hole using ABS cement. This will sandwich the bucket between the two fittings and lock everything in place. [photos #14 & #15]

Speaking of recycling sports equipment, this might be a good time to mention the tennis racket *t'ao ku* drum with golf ball strikers. (The t'ao ku is a very small two-headed drum of the Han Chinese, mounted on a pole and with spherical beaters attached by string. When the drum is rotated by rolling the pole between the palms, the beaters swing around and strike the drumheads.) For the tennis racket t'ao ku, the gut strings of a tennis racket were removed and goat skin was mounted on both sides. [photo #16] On another version I tried door skin, but this instrument simply makes a pun-intended racket! Another tennis racket mounted with several small cowbells simulates the sound of *los enkanika* which are a belt of small bells worn around the waist by *diablitos* or *íreme*, the typical hooded costume dancers in the Afro-Cuban *Abakua* (Abakwa) tradition. They are sounded at certain points when the dancers do a specific twisting motion designed to rattle the bells. Another tennis racket is in the works which will hold a collection of smaller bells including sleigh bells to simulate *chaguoro*, the bells which are traditionally tied around the large end of the *iya*, the lead and lowest-sounding Bata drum. Yes, percussion making does involve more than just hanging out at hardware stores.

Briefly mentioned, other projects have been (or will be) a set of "florist can" timbales, dumbeks (doumbec, darbuka) made from naturally shaped selected gourd shells, various drums from recycled salad bowls bolted together and drilled through to provide a resonating chamber [photo #17], scalar tines mounted on a series of tin can resonators, 'tuned' recycled aluminum pot lids with gourd resonators, collections of worn out circular saw blades simply hung up in varying adjustable scales on a backdrop sounding board, a gourd-based Marimbula with keys cut from recycled wind-up phonograph main springs (at one time the traditional source material in the West Indies), various guiros and "tuned" shekeres [photo #18], a series of 'Sartenes': two different-toned steel frying pans mounted on a board tied at the waist and supported by a rope around the neck (sounds dangerous but it is not, traditionally used in Cuban Carnival parades) the whole collection can be played as a single instrument [photo on first page of this article], ice-cream maker bucket bongos, PVC boo-bams with thin vinyl heads attached with cement, and various single and double headed drums made from found objects like large recycled plastic swimming pool floats, hollow wooden architectural columns, and square wooden frames. Appropriate wooden forms can be assembled until something resembling an interesting drum shape is achieved. For example, four salad bowls piled on top of one another made a drum similar to a Djembe. These quickly constructed uninhibited acoustic experiments drawn from obvious materials available in the immediate environment result in some fairly unconventional sounding instruments, each with their own particular nuance.

For me, the point of all this is to provide instruments that sound different from those which are commercially available and made from the tried and true formulas which have evolved. I was curious to explore the spirit and craftsmanship behind the wider range of inventive, expedient, and sometimes seemingly crude innovations depicted in those all too few and fragmentary antique photographs from Africa, Cuba, Haiti, and Brazil long before these fashionable days of Drum stores, Drums as big business, Drum circles, Drum books, Drum teachers, Drums in every living room, Drum websites, Drum workshops, Drum visionaries, definitive Drum CDs, Drum videos, Drum visionaries, Drum therapists, Drum careerism, Corporate Drum clinics, Drums in the classroom, Drums supported by the government, Drum synthesizers, Drum machines, and plastic Drum heads. Not that there is anything wrong with all that.

Partly based on the sound and spirit reflected in some older field recordings, when hardly anyone even realized what a recording machine was, and partly based on extrapolated fantasies of ancient music lost to the cosmos, I sensed something traditional, innocent, fleeting, idiosyncratic, and original which now seems to be mostly lost outside the creations of some indigenous folklore ensembles. I say this not to promote regret, but rather to wax poignant and to suggest a conceptual inspiration for future musical compositions which might attempt to incorporate this ephemeral quality, and to indicate a deep respect for that folklore and the receptive attitude which gave rise to its initial invention. This is related to, yet somehow different from, the current post-modern form of respect which leads to devoting one's life to religiously copying it, also a worthwhile pursuit in that it hopefully preserves and promotes the known achievements of those very complex aural traditions for posterity (with the distant promise of informed innovation), and certainly different and more respectful than the old modernist's sometimes interesting although skewed exploitation of it.

Zeno Okeanos is a percussionist, artist, and shekere maker. His cassette: "Paradise Island" is available directly from author. Phone 707-795-7656 email: zeno@metro.net

For help with drums, drum lacing and ceramic designs contact: Jesper Nordqvist Earthtone Drums (creating traditional & original designs of ceramic & wood drums) P.O. Box 268 , Sebastopol, CA 95473 Phone: 707-824-9706

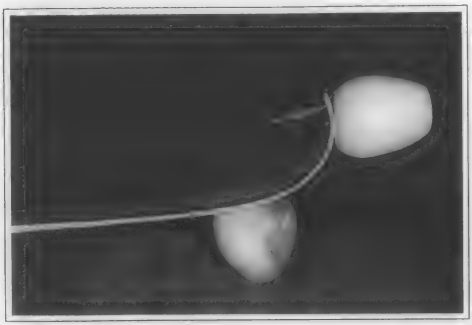


Photo 13. Modified berimbau made from wooden ski. Two gourds make it louder.

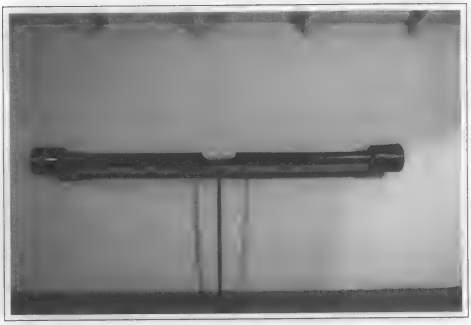


Photo 14. Monochord. Suspended piano wire can be played rhythmically with two thin sticks.

Photo 15. Detail of 1½" ABS plug which tensions piano wire. Note notch in pipe for wrench.

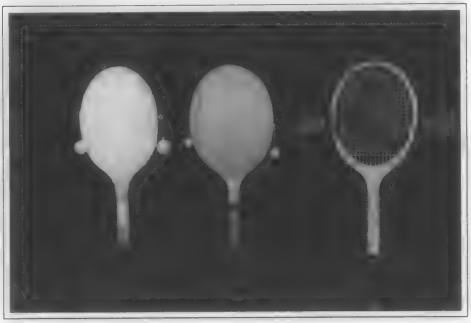


Photo 16. A whole other racket.

Photo 17. Salad bowls combined with assorted wooden forms awaiting drum heads.

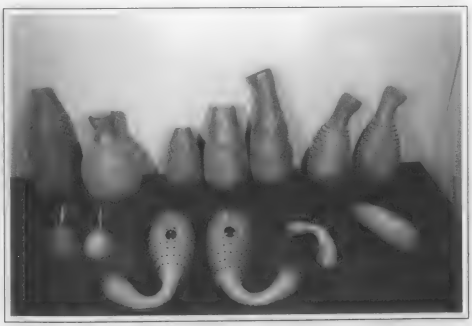


Photo 18. Custom shekeres and quiros are available directly from the author.

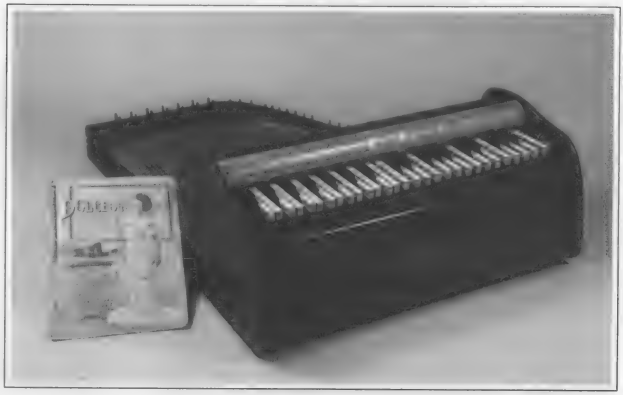
THE DOLCEOLA

The World's Smallest Grand Piano

By Andy Cohen

INTRODUCTION

Imagine a Bösendorfer piano of such a size that Schroeder, the little boy piano player in Peanuts, could really play Beethoven on it. Imagine a gospel sing-off between Blind Willie Johnson and an unknown street-corner deacon from Dallas named Washington Phillips, who played such an instrument. Imagine a recording session for Capitol in Los Angeles in 1944 where Leadbelly, prohibited by union regulations from being a session leader, was "conducted" by a "zitherist" playing one of these contraptions. Now imagine a couple of clever piano mechanics from Toledo (Ohio) who, doing the Zimmerman Autoharp company one better, did themselves in by their own guarantee. That's the story of the Dolceola in a nutshell, and while it is a poignant story, it's not without its humor.



I have reconstructed this story over the course of twenty-five years' investigation, and I admit that much of it is speculative. But my speculations fit the facts as I know them, and I doubt that anyone knows any more of them than I do.

My involvement started at the 1971 Philadelphia Folk Festival. There I heard Bob Stelnecki, who played washtub bass with a band called The Sorry Muthas, do Washington Phillips's "Take Your Burden to the Lord and Leave it There." I was immediately intrigued by the peculiarities of the accent in which it was done: "Just remember in God's *woids*, how He fed those little *boids*, take your *boiding* to the Lord and leave it there." Bob had gotten the song from an old blues reissue record. At the time, nobody but a few collectors knew anything more about Phillips than that he had a beautiful voice and played gorgeously on an instrument no one had ever seen. All that was known about the instrument was what Phillips' recordist, Frank Walker, had said in an interview many years later, "it was some contraption he built himself, and no one but him could play it." That reissue, however, stimulated collectors to search for more of Washington Phillips's 78s, and for the instrument itself.

WASHINGTON PHILLIPS

Washington Phillips recorded nine 78s, eighteen songs. Of these, three were two-part songs that he had written himself, comprising both sides of the record.

Photos, this page —

Above: Dolceola belonging to Roger Kasle, on the occasion of its being transferred to him by Elderly Instruments.

Left: Washington Phillips. The instruments he's holding are not dolceolas.

The most famous was "Denomination Blues," a minor hit both for Sister Rosetta Tharpe in the forties, and again in the early seventies when redone by Ry Cooder. One of the two-part songs he wrote never made it to public view until recently. Most of the others were well known gospel songs written by Rev. Charles A. Tindley (1851-1933) of Philadelphia in the early part of the century. In all, Phillips' extant recorded output amounted to fifteen songs and one recitation-cum-instrumental, documented in *Blues and Gospel Recordings: 1902-1942*, by R.M.W. Dixon and J. Godrich.

The first more or less complete reissue of Phillips' work, released by Guido van Rijn in 1979 as Agram 1005, was also called *Denomination Blues*. This Dutch disk featured a picture of an old hammered dulcimer on the cover, and transcribed words in the insert. Since then, both Document and Yazoo/Shanachie have also done complete reissues, the latter including notes by the redoubtable Pat Conte, who informs me that the missing two tracks, "You Can't Stop a Tattler," parts 1 and 2, were recently found and pressed into vinyl from the original metal master. As for Mr. Phillips, all we know of him for sure, aside from the surviving recordings, consists of the statement by Frank Walker, and two postage stamp sized photographs. In one of these he is holding two zithers, neither of which is a Dolceola.

Front cover of a promotional brochure

Gary Fortine, a blues researcher from Cincinnati, scouted around when he lived in Dallas, and found a death certificate for one George Washington Phillips in the records of the now-defunct sanatorium, dated 1939. Gary also located a man by that name in one or two of the old city directories, whose occupation was listed as "farmer." In those days, one went to the sanatorium for one of three reasons: insanity, often of a criminal variety; syphilis; or tuberculosis. For reasons of delicacy and good sense, we shall here assume the last. In any case, all that is known about Phillips is what has been related here; and here the speculation begins.

Dolceola studies owe a great debt to the aforementioned Mr. Conte. This gentleman makes his living at a postal facility in Queens, New York, but for over twenty years has collected 78s and the instruments that go with them in an effort to learn what made old time musicians tick. He has successfully negotiated stocks of pristine 78s out of obscurity and onto compact disc from all over the world. His series, presented on the Shanachie label, is called "The Secret Museum of Mankind," and his WFMU radio show is called "The Secret Museum of the Air." Some years ago he set out to find an instrument of the type Washington Phillips played, knowing for sure as an accomplished musician that whatever it was, it was not a hammered dulcimer.

I laughed until I cried when he told me the story of how he hired an agent to find a Dolceola, meanwhile continuing to search on his own for one. They found the same one simultaneously, and Conte ended up bidding against himself through the guy he had hired. Every time he submitted a bid, his agent upped him twenty-five bucks, not realizing that the person he was bidding against was his own client. Conte finally bought the thing, and the mystery of Phillips's angelic sound became clearer.

Pat explained to me why Washington Phillips' Dolceola sounded so angelic in recording. I will paraphrase him, since it's been a while, but what happened was this: Dolceolas were made with little feet that resemble the tops of old fashioned push-type clothespins. These three feet supported the instrument on a wooden table, and the table itself acted as a secondary sound board.

When Phillips played and sang, the old RCA ribbon mike (like the one used by Edward R. Murrow) sat on the same table. As he played, the vibrations traveled through the feet of the instrument into the table, up the base, around the yoke and into the mike, resulting in a peculiar warbliness recorded at the same time as the instrument and voice were being recorded through the air.

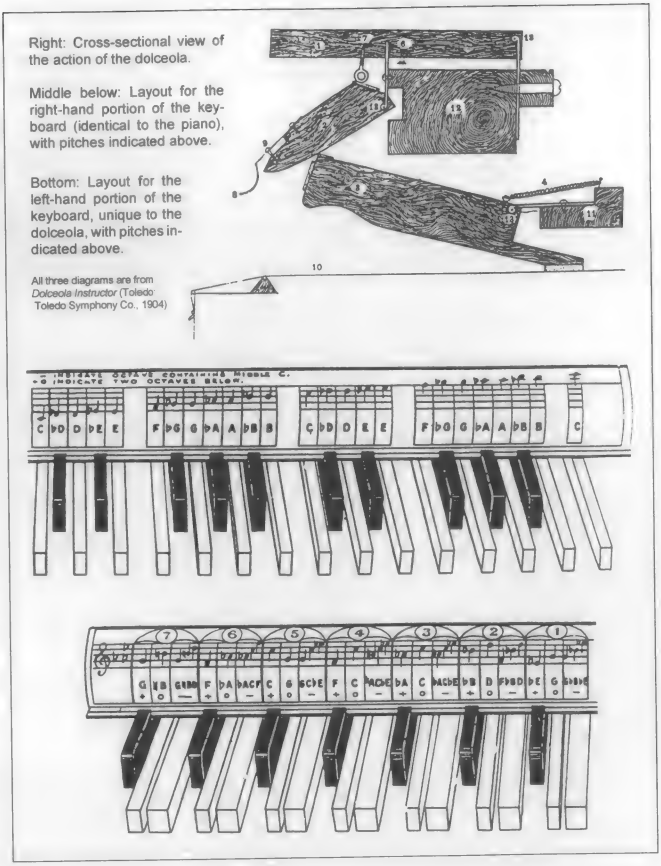
What Phillips was doing with one of those things in the first place constitutes the mystery. Distributed from Toledo, Ohio, Dolceolas have been found mostly in the surrounding states, as far west as Missouri and as far east as New England. A bunch of them went out to California during the company's short life, but none is known to have made its way to Texas. Here is my pet theory.

UTTER SPECULATION

Guido van Rijn's interpretation of the internal evidence of the words to Phillips' self-written songs suggests that Phillips might have been a member of a non-mainstream church. But his exquisitely fine tuning of the Dolceola, his attack, his singing voice, and the sorts of sentiments he voiced combine to suggest refinement and education, albeit in Southern syntax. The recordings were made in Dallas over the course of three spates of two sessions each, with about a year intervening, from December 1927 to December 1929. In the recording booth were Frank Walker and Columbia's road team, which also recorded Blind Willie Johnson during these same periods. Phillips and Johnson recorded different versions of two of the same songs during these sessions, "By And By I'm Gonna See The King", and "Take Your Burden To The Lord And Leave It There." This last, and all the other songs that Phillips did not write himself, were versions of songs written by the great "social gospel" preacher, Rev. Charles Tindley.

Rev. Tindley labored his way into literacy while working from the eastern shore of Maryland into Philadelphia. He was a

workingman's preacher, sermonizing not only about the rewards of Heaven but the hardships of life in the world. His was an early version of liberation theology, capable of laying the blame for earthly misery on earthly conditions. Tindley's Philadelphia church seated three thousand parishioners at a time, and membership was over ten thousand. They may have had many programs going on at once, and my private opinion is that young Washington Phillips went (or was sent) to Philadelphia from Dallas to get an education. I think he picked up the songs, the education and the Dolceola there, within the known envelope of its distribution, during the Dolceola's heyday. I would guess that if he were educated there, a record of his being there would be left, sometime between 1904 and 1909.



Right: Cross-sectional view of the action of the dolceola.

Middle below: Layout for the right-hand portion of the keyboard (identical to the piano), with pitches indicated above.

Bottom: Layout for the left-hand portion of the keyboard, unique to the dolceola, with pitches indicated above.

All three diagrams are from *Dolceola Instructor* (Toledo: Toledo Symphony Co., 1904)

INVENTION AND MANUFACTURE

The Dolceola was invented, manufactured and modified in Toledo, Ohio by two brothers, David P. and Leander F. Boyd, starting in 1903. The company went into receivership in 1907, a bad year for small concerns, succumbing entirely to market forces in 1909. In the past several years I have located about thirty surviving Dolceolas in various states of disrepair, plus a flock of Marxophones, Piano-mandolettes, Zither-mandolins and other assorted biscuit boards. All the others, except some of the zithers, were made in Joisey City at the factory on Ferry Street that successively turned out Zimmerman, Marx, and Oscar Schmidt instruments. The Dolceola bears little resemblance to these.

David Boyd was a piano tuner and teacher working for his brother Lee at Lee's piano store on Adams Street in Toledo. While working there over the course of about five years, they saw a need for a small, portable instrument that, according to the brochure that came with the Dolceola, could be taken to "... picnics, parties, dances and other outings." Working nights and weekends over about five years, the two brothers developed and patented this instrument. In the Winter of 1903, Lee held a going-out-of-business sale, sold about $10,000 worth of stock to some local capitalists, and began production at the Symphony Manufacturing Company.

KEYBOARD AND MECHANISM OF THE DOLCEOLA

Look at the diagram above. The top drawing is the chromatic side, and the bottom drawing the chord side of the plate covering the Dolceola's internal works, along with a representation of its keyboard. It is a small piano or, if you like, it is a seven chord accordion, with strings instead of reeds. To the left (the portion of the keyboard shown in the lower drawing) are the seven chords, and on the right (the portion above) there are two chromatic octaves. On the chord side, the key bank is organized as follows: the black one, at the extreme left of each group of three, strikes a root bass note; the first white one strikes a third or a fifth, and the second white one strikes a triad appropriate to the root. The right side is laid out just like your grandmother's old upright, only about a fifth the size.

Tuning the Contraption

The Dolceola was constructed as an E-flat instrument, designed for use with music published specifically for it by the publishing arm of the Toledo Symphony Company. Professor William Hetterick of Hofstra University, a music historian whose grandfather was brother-in-law to David Boyd, explained the tuning of the left side of the Dolceola in a paper he wrote to accompany a talk he gave on it. In it he related that the chords

are numbered (see diagram) one through seven, from right to left.

No. 1:E♭ / G / [g -b♭ - e♭] (E flat "I")

No. 2: B♭ / D / [f -b♭ - d] (B flat "V")

No. 3: A♭/C/[a♭ - c - e♭] (A flat "IV")

No. 4: F / C / [a - c -e♭] (F 7th, "V-7 of V")

No. 5: C / G / [g - c -e♭] (C min or E flat 6th, i.e., relative minor or "I-6")

No. 6:F/A♭/[a♭ - c -f] (F min, "ii min" or "IV" in key of C min)

No. 7: G / B / [g - b - d] (G, "V" in relative minor)

You can see that playing in E flat, B flat, C minor and possibly F minor (judiciously) are possibilities. If Washington Phillips did not retune his Dolceola, he kept these relationships or modified them slightly, but cranked all the strings about three quarters of a semitone higher than intended.

Retuning the Contraption

Here's how I tune mine. Remember that the Dolceola is essentially an accordion actuated by strings. That being the case, I set it up like one, but backwards, so I can boogie. Lining it out like it is on mine, C is in the middle, and the chording follows a circle of fifths, with flats to the right and sharps to the left, like so:

A			D			G			C			F			B♭			E♭			(black keys)		
C#		A♭mj		F#		D♭mj		B		G♭mj		E		C♭mj		A		F♭mj		D		B♭♭mj		G		E♭♭mj	(white keys)

If you do this, several things fall into place for easy use. For instance, wherever you start, the bank on the right is IV and the bank on the left is V, follow?

Next, you can "Oompah" by playing, for instance, "C -C♭mj - G - C♭mj", using index-thumb-middle-thumb. To boogie, you use middle-thumb-middle-thumb, going "C- C♭mj- C- F♭mj". I worked out Skip James's "If You Haven't Any Hay" like that.

Also note that when it is set up like this, all the patterns are consistent throughout the chord bank, so you can find minor chords on the bass keys (A-C-E, using 4-1-T in the left hand), and you can move the formation to the right to get D minor, G minor and C minor. I worked out "The Entertainer" doing this, at least three parts, in the right key and with the right chords.

The only bass note you're missing this way is an A♭. I haven't figured out how to put one in, but I might substitute the E♭, because I never use it except when I boogie in F.

Another thing to notice is that your "ragtime" chords (III-VI-II-V-I) are all laid out in front of you. Starting from F, say, and going back to A, you have F-A-D-G-C.

Washington Phillips himself might have figured all this out. He never uses any minor chords, only majors, even though several of the "given" chords on the instrument are minors, and there is even a diminished chord, sort of (#4). Phillips uses a III chord sometimes, which means he would have had to alter the extreme left bank from G to A.

As I've altered it, and as I suspect Phillips did also, it is most useful in F (where Phillips played), C and G. You can also back up both American and British fiddle tunes in the key of D very easily — my wife Larkin and I worked out "Julie Ann Johnson" and "Merrily Kiss the Quaker's Wife" in the keys of D and G respectively; the Dolceola makes a fine backup instrument for old-time tunes like that.

THE ACTION OF THE DOLCEOLA

A look at the photos and the diagram on the preceding page will give you a sense of the lay-out for the Dolceola's keys, action and soundboard. The instrument has one string per key for the right-hand side of the keyboard (the standard, scale-wise side). On the left side (the bass-and-chords side), the strings are set in chordal groupings according the arrangement of the keys above. Under each key there is a little screw-eye, like the ones you put in a picture frame. When you strike one of them, that screw-eye pushes down on a lever, called a "jack," which in turn pushes down on a formed piece of wood that is a striker behind (that is, toward the player) and a damper in front. This piece is spring-loaded at its forward end, and the spring is stretched over a pin embedded in a block above and forward of the damper end. The chord strikers are a little wider than the individual string hammers, but otherwise, all three levels of the mechanism appear to have been formed out of single pieces of wood and then run through the moral equivalent of a bread slicer. Each level of the mechanism rotates on its own common swivel, a center-wire about as thick as a coat hanger.

Another view of the dolceola keyboard, this time on an older instrument now residing at Sun Studios in Memphis.

SELLING THE DOLCEOLA

It is easy enough to visualize the initial envelope of distribution: Toledo was a major railroad hub at the time, and the instruments I have seen (see chart, below) were owned by people from Michigan, Pennsylvania, upstate New York, New York City, a couple in New England, and a couple in Missouri. David Boyd was in a good position to make some money, but despite some extensive (and hyperbolic) advertising campaigns in *The Etude, The Musician,* and some other magazines, things ran dry after 1907. In addition to the fact that 1907 was just a bad year — many thousands of small businesses went into receivership, or went under — I have an idea why.

The Dolceola cost $25.00, according to an advertising brochure printed up on its behalf. It came in a cardboard box; for another six bucks you could get a formed canvas case lined with red fuzz (precisely two of these still exist, as far as I know). So, as an inducement, David offered to tune it free if you sent it back. Let's see, seven chords, five strings apiece, and twenty five

individual strings — that's sixty strings. Now, there are disagreements as to the number of instruments made, but I guess between forty-five hundred and six thousand, if the serial numbers on them are consistent. If he made a thousand instruments a year, and a tenth of them were sent back to the factory for servicing and tuning, by 1908 or 1909 Mr. Boyd would have been doing little else but servicing and tuning instruments. The company went into receivership in 1907, during which time the Boyds lived with Professor Hetterick's grandfather, the canvas magnate. From 1910 to 1914 David's wife Adelaide operated an advertising circular business. The Toledo city directories of 1914 and beyond show one David P. Boyd working as a pneumatic tire salesman in his own store.

In the early days of the company, brother Lee had apparently packed up some Dolceolas and headed for California, where he died over fifty years ago; his brother David passed around 1930, just after Washington Phillips made the first recordings using his instrument. It is not likely that either Boyd ever heard them.

What happened to the instruments? Professor Hetterick disagrees with my estimate, thinking it much too large, but doesn't have any evidence on how many were made. However many there were, some went to California where they were sold by Lee. One of these ended up in the hands of a man named Paul Mason Howard, the "zitherist" on Leadbelly's Capitol 78s, recorded in October of 1944. These were later compiled into an LP called *Grasshoppers In My Pillow*, re-released in the early sixties.

What probably happened to most of the instruments is that they went bye-bye in one way or another. Most were probably pitched or used for firewood. Since the company dissolved in 1909, there would have been no one to service them except for the odd tinkerer. Several of the instruments I have seen, in fact, have been cobbled in various ways to make them work, such as by attaching struts to the outside when the splines that held the frame parts together were broken.

Passing knowledge of this arcane instrument on to a new generation — author Andy Cohen does it all the time.

HOW THEY BREAK

Dolceolas self-destruct in the same way that autoharps do: they implode and they crack. The tension of sixty strings pulls against the hitch pins at the lower end of the instrument and either (a) breaks the glue joint between the inferior surface of the pin block and the superior surface of the back, thus causing the top to sink in the middle; or (b) breaks the wooden spline that joins the pin block and the left side together. The luckier of these two eventualities is the latter, as it leaves the top in better shape to be repaired. Nevertheless, whichever way the instrument comes apart, the back is invariably broken and needs to be replaced.

The fact that the body tears itself apart actually helps to preserve the action, because once the body ceases to hold a tune, the instrument ends up in the attic or in the cellar or out in the barn. Once there, the felt pieces rot, while the strings, pins, screws and springs rust, but the wooden parts tend to stay integral and together. Even when the felt disintegrates, says Bob Mead, a glue mark indicates what went where.

I would like to think that at least four or five thousand instruments were manufactured, and that a lot of them are still around, though obviously in bad repair. I have seen several different versions of the Dolceola. They have a four-digit serial number stamped or burned both on the superior surface of the back and visible through the sound hole, and on each of the internal cheek plates, inside the keyboard cover. In no case that I have seen have any of the numbers differed between the two locations (indicating a replacement action or sound box); and in no case has the number been fewer than four digits. The numbers range from 1426 to 5452. If the serial numbers were consecutive, as I suspect, the smallest numbers would indicate the most elderly instruments. As a check, we can see that the measurements differ slightly between the older and newer ones, and there is an adjusting spring added on the back of the jack in the newer ones, at roughly mid-series. Mine (#3811), for instance, has it, while Caroline Patron's (#2615) does not.

A partial database of surviving Dolceolas appears on the following page.

BY THE NUMBERS

Now, it is possible that the numbers were consecutive from 0001 to the last one issued, whatever that one was; or it may be that they were consecutive from 1001 to that last number. It is even conceivable, though not probable, that several series were simultaneously made, each with a slightly different pattern to the action, and which started the serializing over from some new point, though this also seems doubtful to me.

So far, a number of differences among the Dolceolas have emerged, correlated with the upward sequence of numbers. I will not discuss all of them here, as there are many, and they are picky. But changes in certain features of the keyboard, action and body construction suggest periodic meetings among the staff to discuss ways of improving the instrument.

The easiest change to see is on the keyboard itself On the earliest ones (1426 and 1781, belonging to Dobro Dick and the Blues Hall of Fame respectively), all the keys are straight, and about 3/16" wide except for the chord keys, which are slightly wider. On Pat Conte's (2261), R.P. Hale's (2471), Caroline Patton's (2515) and Dobro Dick's second one (2793), the chromatic keys are straight, but the first of the two white keys in each chord bank on the left side of the instrument "hooks" around the adjacent black key in the usual fashion of a larger keyboard. On all the rest of the instruments, the chromatic keys are hooked as well.

Another difference is the presence or absence of what the Boyd's mechanism plan terms the "flat jack spring." The jack, remember, is the middle piece of the three-part action, and on its rear in all cases there is an adjusting screw. On 3660, the one Margaret Macarthur gave me, jack springs are present, pierced by the adjusting screw; the jacks on 2615, Caroline's, did not

have them, nor were they on 1426, 2261, 2471, or 2793. I replaced the jack assembly on Caroline's, along with her keyboard, substituting the ones from Margaret's, which did have the springs on it. As with the keys, the jack springs are present through the rest of the sequence.

It is not clear where in the sequence the flat jack springs first appear. It may be one of a long series of small changes, or one of a short series of modification clusters; it's hard to tell with such a small sample. What may explain some of the modifications (white key "hooks", flat jack springs, changes in coloration and so forth) is that the company was reorganized between 1904 and 1906 (it is not clear when). Following this, and despite the aforementioned advertising campaign, it went into receivership no later than 1908, and never recovered. The "Symphony Manufacturing Company" became the "Toledo Symphony Company"; Leander, first president, had gone to California, and David took over. Associated under the Symphonic umbrella, which handled publishing chores, was the Dolceola Company, which manufactured the instruments. Originally, the manager for the manufactory was one Edwin Boyd, who was probably a third brother. Edwin disappears from the historical record after 1904.

Bob Mead, who is fixing both of Dobro Dick's Dolceola, tells me that on 1426 all of the jacks are "arced" (curvilinear). But on 2793, they are all straight except for the ones associated with the chord keys. Again, this pattern follows for the rest of the known ones. Since this modification appears before the installation of the flat jack spring, I think that there was a long series of small changes, ones that occurred in lot-sized batches, as feedback was passed from various players back to whichever Mr. Boyd was running them at the moment. Perhaps they had a suggestion box.

CONCLUSION

It's a funny kind of story, occurring in a series of hops from 1903 to the present day. Among my contemporaries, arguments still fly about the numberings: Bob Mead agrees with me that there were about six thousand

PARTIAL DATABASE OF KNOWN SURVIVING DOLCEOLAS

rec#	ser#	owner	city	state	condition	location	state of discovery
1.	1426	Dick Dillof	Livingston	MT	being fixed	Bob Mead's	MA
2.	1781	J. Montague	Memphis	TN	poor	Sun Studios	PA
3.	2261	Pat Conte	Long Island	NY	playable	at his home	NYC
4.	2471	A.M. Cohen/ R.P. Hale	(see information below)				
5.	2615	C. Patton	Sharon	CT	playable	at her home	MI
6.	2793	Dick Dillo	fLivingston	MT	being fixed	Bob Mead's	CO
7.	3660	T.Humphries	Akron	OH	poor	Ross Music	VT
8.	3811	A. Cohen	Memphis	TN	playable	at his home	nw NY
9.	4198	S. Marshal	Pacific	MO	Good	at her home	NY
10.	4247	Roger Kasle	Oxford	MI	Repaired	at his home	FL
11.	4318	Paul Malan	Cleveland	OH	Fair	at his home	OH
12.	4715	Smithsonian	Washington	DC	weak	under curation	MI
13.	4775	Anonymous	midstate	NY	playable	at his home	NYC
14.	5207	Pat Wilco	Delaware	OH	poor	at herhome	NY

Notes on acquisitions: "Dobro Dick" Dillof, Pat Conte, Caroline Patton, Roger Kasle, Pat Wilcox and I all acquired our Dolceolae as a result of running into the Washington Phillips material. Mr. Malan has "had his ever since his father brought it home in 1922;" Tom Humphries, who owns a music store and is a major collector, has one, in pieces, that I gave him, which Vermont folksinger Margaret Macarthur gave to me. The keyboard from that one replaced the one on Caroline's; Tom has that keyboard now. The Smithsonian Institution owns one, which it keeps under curation in its humidified room, along with Jesse Fuller's "Fotdella" and a lot of other American folk instruments. The Blues Hall of Fame, owned by collector John Montague here in Memphis, bought his through Richard Hire (formerly of the group Canned Heat), who got it from Roger Mesiewicz, a 78 collector, who found it in a junk shop in Pennsylvania. Sue Marshall, who saw me play one a few years ago, turned one up that came (via the Internet!) from Sid Glickman's Music Shop in New York City. There are a few more Dolceolas in the data base, but I have little information about them, and none of that is needed here, so I have left them out of this discussion. Recently, I acquired #2471 from the Music Emporium in Lexington, Mass. It is in very favorable condition, and its conformation fits my "progressive modification" hypothesis perfectly. It will eventually go to Baroque keyboardist R.P. Hale, who deserves it...

Notes on repairers: David Rice, who has fixed Caroline's, Roger's and mine, works at Goose Acres in Cleveland. Bob Mead is an engineer and autoharpist who is fixing the two owned by Dobro Dick. These two gentlemen constitute the current repair department, and are making notes as they go. Bob is especially finicky about his repairs.

DOLCEOLA NUMBERS WITH MODIFICATIONS LISTED

	Ser.num.	Chord keys	Chrom. Keys	Jacks	Jack Springs
1.	1426	straight	straight	curved	no
2.	1781	straight	straight	curved	no
3.	2261	hooked	straight	???	no
4.	2471	hooked	straight	straight	no
5.	2615	hooked	straight	straight	no
6.	2793	hooked	straight	straight	no
7.	3660	hooked	hooked	straight	yes
8.	3811	hooked	hooked	straight	yes
9.	4198	hooked	hooked	straight	yes
10.	4247	hooked	hooked	straight	yes
11.	4318	hooked	hooked	straight	yes
12.	471 5	hooked	hooked	straight	yes
13.	4775	hooked	hooked	straight	yes
14.	5207	hooked	hooked	straight	yes

made, and that about a half a percent are still extant. Pat Conte, Dave Rice and Professor Hetterick all think that between a hundred and some number quite a bit less than six thousand were made, but so far neither side in the argument has come up with a numbering system that accounts for the numbers extant. David Evans, the blues scholar, feels that Washington Phillips (a) might have played a zither on some of his tracks (Conte disagrees); (b) was a member of a mainstrain denomination, Baptist or AME (Guido disagrees); and I never could figure out why David Boyd invented an E-flat system, rather than one based, say, in the key of C, like the instruments made around the same time by the Marx company. I'd also like to figure out if Washington Phillips modified the system in an intuitive, accordionesque leap similar to the way I have restrung mine.

On the other hand, a good argument never hurt anybody, and so far everybody has been gentlemanly about it. And the conversation generated by the Dolceolas, their discovery and repair has extended farther than I have intimated: there are now people in all parts of the United States looking for them, and scheming how to get them fixed, just because they are such a kick, and for no other reason. I take mine with me everywhere I go, set it up and let little kids play it. It's sturdy, they can't hurt it, and when would they ever get another chance? Besides, their aunt might have one...

I would like to thank the following people for their help and patience in the preparation of this article: Liz McCullough and Lizette Voyatzis of the Smithsonian's National Museum of American History, Music Division, for letting me see the "national" Dolceola; Professor William Hetterick, for correcting any number of my screwy notions; Pat Conte, for general inspiration; Drs. David Evans and Guido Van Rijn, as well as Bob Mead and David Rice, for critically reading my manuscript; the Toledo Public Library; and all the owners of Dolceolae who let me bend their ear at one time or another. I would also like to thank Bart Hopkin for his endless patience with this article.

Andy Cohen is a musician by profession. He and his wife Larkin specialize in Old Time Music broadly defined, including all the ethnicities of traditional music recorded in America from 1894 to 1943. This is the span of years from the first wax cylinders of black quartets to the Petrillo recording ban. He is trained in several strains of Anthropology, and has been on the road much of his life, often leading a sightless blues or gospel player. In addition, he has started or administered a number of folk-type venues, and is wild about funky old musical instruments, especially if they can be made to work.

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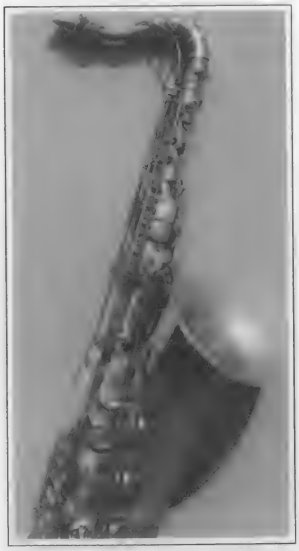
THE NEW SAX FINGERING SYSTEM

by Jim Schmidt

I have spent most of my life inventing, designing and fabricating mechanical things, mostly driven by the need for speed and power to win motorcycle races. Through the years I have occasionally immersed myself deeply into music. It became natural for me to improve my vehicles of expression (flute & sax) in the same way that a racer must constantly design and re-design his machine in order to win. It is this attitude, this scientific approach, that has enabled me to start from scratch and re-design the sax and flute for the sole purpose of improving their "playability" and "performance."

The logic behind my fingering system is straightforward. *One note follows the next chromatic note by closing down the next key with the next finger of your hand, and so on down the line, one after the other in linear sequence* (see hands illustration); not here and there, helter skelter as on conventional saxes.

This new fingering system is easy to memorize and enables the player to perform passages with great ease and rapidity. Chromatic scales sound wonderfully smooth. All scales, regardless of how many sharps or flats are involved, can be easily played. As you know, the conventional sax fingering is built around the C major scale with the sharps and flats of other scales inserted where they can fit. Because of this, many other key signatures become more difficult to play. My sax overcomes this problem because it is based on the chromatic scale which is the only scale to include all twelve notes of the octave. C major (and every other scale) is a sub-category of the chromatic scale.



Contralto saxophone by Jim Schmidt

Since the toneholes are generally located directly underneath the fingers being applied, the player understands that he/she is making the sax longer and dropping the pitch by applying more fingers, making it shorter and raising the pitch by lifting fingers, or venting it for altissimo by lifting some fingers and closing others. This direct link of fingers over tone holes enables players to visualize what they are doing to the sax.

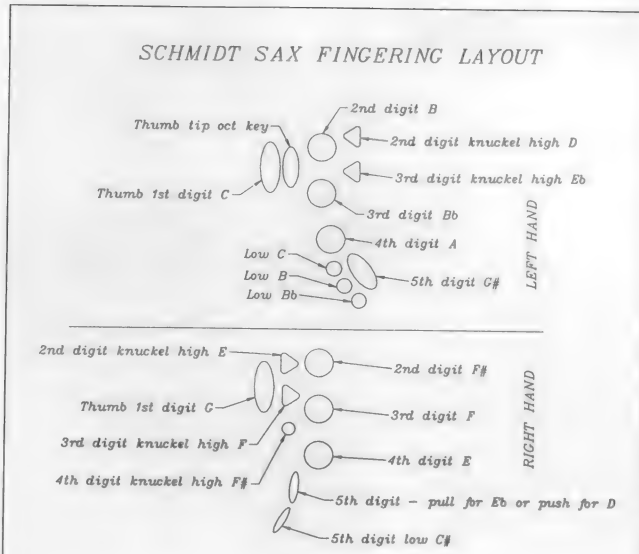
Suppose we are playing a tune in C major and want to transpose it up to C#. Play the first note, then simply lift one finger to raise the pitch one chromatic note. Do the same with the second and third note and work your way through the entire piece. Its easy to see that there is a pattern to be followed. This pattern can be employed to transpose a tune up or down any desired interval. All of a sudden you've got mathematics working for you instead of against you. The patterns between chord intervals and harmonic structures become clear and apparent. The relationships between standard chords and their extensions become easier to grasp than with the Boehm method.

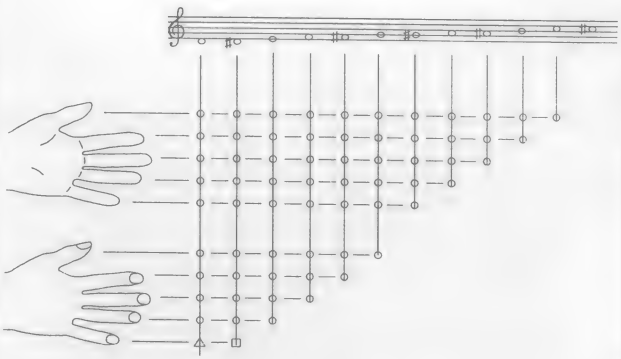
Tenor saxophone by Jim Schmidt

When you look at the messy construction of a conventional sax you see a lot of redundant keys such as side keys, B♭ bis-key etc. (see fingering illustration). All of this junk needs to disappear. *In the new system, scales and tones are cleaner and quicker due to the fact that each hole is independent (except the lowest notes) and is not loaded down by interlinkage mechanisms as are, for instance, mid-Bb and F# in the conventional Boehm method.* Tones are also clearer because you have the choice of closing only those holes which produce the best sound. This is especially true when playing altissimo.

Low note trills and interval tremolos are now available — a big advantage over conventional horns. A unique technique is employed to achieve this which allows two fingers to operate the low note touchpieces instead of just the pinky. For example — you can hold down low B with the ring finger while trilling low Bb with the pinky (spring pressures are about 1/3 as heavy as found on conventional horns). There is also a special right thumb tip key which operates only the neck octave vent — this key facilitates the secure playing of harmonics, upper partials, multiphonics, etc.

Both thumbs are used on my sax. The right thumb





THE FINGERING SYSTEM OF THE NEW SAX:

A chromatic scale can be played by simply lifting in succession the fingers of the right hand and then the left, creating a one-to-one correspondence between the fingers and the twelve pitches. D and D# are both played by the little finger of the right hand, operating a special touch-piece which can produce either note. C# sounds when all (left hand) fingers are up. Top keys are operated by the fingertips or beneath the knuckles as the player chooses. The octave key is operated by the left thumb tip. The combination of neck strap, belly-guard, and hook on the right thumb key allows free operation of the thumb key while supporting the sax. Low C# is operated by the right little finger; Low C through Bb are operated by the left little finger.

key is an unusual combination of touch piece and thumb hook. A special guard keeps the sax clear of the players body so that the right thumb is free to operate its key.

Other features include the use of new materials and designs in the key work such as:

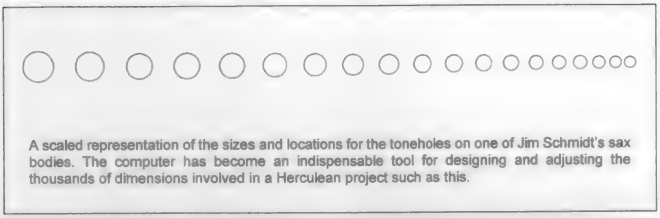
• Sleek, low-profile keys which are precision machined from solid stainless steel plate. The keys are designed to be much stronger to resist bending which would upset the precise seal of the synthetic pads. Conventional keys and pads are too thick and bulky. My lower profile keys offer more control, a lighter & better feel. The top keys can be played with either the undersides of one's knuckles (as with conventional palm keys) or with the fingertips.

• Elimination of posts and tone-deadening ribs which have been replaced by one-piece bridges, reducing unwanted weight and solder joints. This enables my sax to project with greater clarity, tone color, and volume when necessary. The improvement between my new sax and conventional saxes is not subtle, it is obvious. It is much closer to the ideal of a bare horn unencumbered by key work.

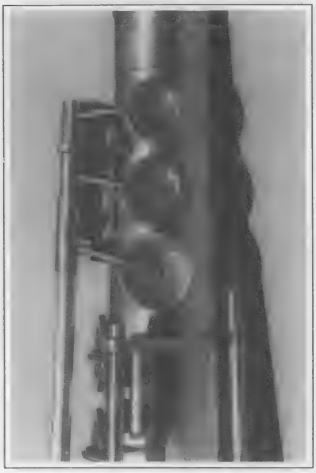
• More even spring pressures throughout the key work due to the elimination of interlinkage mechanisms (such as F# on conventional saxes). The keys require minimum closing pressure to seal the pads.

• Excellent intonation due to the fact that there are no flattened or shaded notes (which occurs with interlinkages). This allows an even graduation of tone hole size and location, allowing correct location at the exact nodes of the scale which in turn provides better response, tone production and intonation (see tonehole illustration). In contrast, the tonehole layout used on conventional horns is uneven and compromised in order to accommodate the tuning difficulties created by the interlinkages of the Boehm fingering system. This is why conventional horns have some notes that sound better or worse than others.

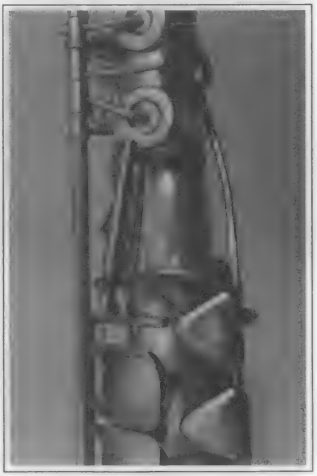
• Incorporation of more durable pads which eliminates the most troublesome aspect of sax maintenance. These pads are quiet, form an excellent seal and are much longer-lasting than conventional pads. Skin deterioration, moisture warpage and all those other headaches are no longer a problem. The internal (bore side) of each cup has a smooth metal surface that forms a very streamlined internal shape — perfect for boosting your tone production. These pads are much more like O-rings or gaskets.



A scaled representation of the sizes and locations for the toneholes on one of Jim Schmidt's sax bodies. The computer has become an indispensable tool for designing and adjusting the thousands of dimensions involved in a Herculean project such as this.



Above left: The top notes on the tenor sax use magnets instead of springs.
Above right: Right hand keys on the tenor.
Below left: Left hand keys on the alto. Below right: Alto again; top notes.



They fit into a narrow groove in a machined cup and make conventional pads look like an obsolete design in comparison. Those old bulky conventional felt pads act just like mufflers and contribute to the stuffy tone of conventional saxes. When you look down the bore of my sax, all you see is the flush metal undersides of the cups and the horn tube. That's the best surface you can have for reflecting sound waves. These new pads work so well that I thought I could make some money by selling them to the major instrument companies for use on conventional horns. To my surprise they weren't the least bit interested — they didn't even want to know about them.

Flutes, alto saxes and tenor saxes are being produced at present. In addition I have designed a completely new size saxophone which has the proportions of today's best tenors but has been down-sized to incorporate the ideal dimensions between the alto and the tenor. It is called a *contralto* (in the key of C). It has a wide-open sound and wonderful tone color. It offers new dimensions of sound beyond the capabilities of conventional saxophones (because of its large bore and wide conical expansion, it shares absolutely nothing in common with the smaller, ill-fated C-melody sax).

Jim Schmidt is a self-taught engineer and designer who is presently building flutes and saxophones in his small shop in Sanger, California. When not building instruments he is either practicing or performing jazz with a variety of players in and around Fresno California, San Diego, San Francisco or New York. Jim intends to personally demonstrate the advantages of his instruments in the years to come by honing his performance skills and displaying those skills on the jazz stage. He also gives school presentations and exhibits at conventions whenever possible.

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In the following article René van Peer describes the various aspects of Paul Panhuysen's work with long string installations. The text, based on interviews with Panhuysen and a long acquaintance with the work of this Dutch artist, was adapted from liner notes the author wrote to Panhuysen's CD *Three Partitas for long strings*, released on XI, the label of the Experimental Intermedia Foundation in New York.

PAUL PANHUYSEN'S LONG STRING INSTALLATIONS

By René van Peer

Since 1982 the Dutch artist Paul Panhuysen has built around 300 long string installations as part of his work. The first of these was built in a hall in the German city Mainz where he had been invited to show his systematic paintings. The appearance of the space was so dominant that he decided instead to make something which could respond to its architectural properties. Using six steel strings he designed a three-dimensional drawing in the hall. The strings were played by the members of Panhuysen's music group, the Maciunas Ensemble, to direct the attention of the spectators towards the barely visible installation. In this installation, which arose from circumstance, different strands in his work so far converged – his lifelong interest in sound; his work in architectural contexts as artistic advisor to urban planning teams; and an interest in integrating elements of a given situation in a work made for that specific occasion.

The decision to make an installation with long strings led to a significant discovery – through these simplest of means (a length of wire stretched across a space) it is possible to make pieces that work simultaneously on a visual and a sonic level, integrating the two. Long string installations proved to be flexible tools for the simultaneous exploration of these two aspects. The emphasis has varied according to the given space, the accumulated experience with these installations, and more general considerations and interests that have always played an important role in Panhuysen's work.

Fig. 1. 'Nowhere'. Schellens Factory, Eindhoven, 1995
Paul Panhuysen brushing long strings in concert.
Photograph: Peter B. Kaars ©

With long strings to be installed in ever different spaces as his point of departure, Paul Panhuysen has in some 300 works experimented with the various elements of that phenomenon — the strings themselves, the space, resonators, tension and weights, tuning systems, techniques of playing and the use of automatons (gadgets that play the strings automatically). This article is based on his observations in more than sixteen years of experimentation and exploration. It is important to note that to Panhuysen the aim of making these long string installations has never been to perfect them into a definite instrument; instead they are an instrument in the sense that they can serve as a means, a tool for exploration and for expressing musical and extra-musical ideas.

THE STRINGS

The principal element of these installations are of course the strings themselves. Through them Panhuysen determines the sound and the image of each work. The sound of any string is determined by four intrinsic variables — material, gauge, tension and length. Further determining factors can be the acoustic properties of the space where an installation is built, resonators to which the strings may be attached, and techniques used for playing.

The material of which a string is made affects in particular the character of the sound. Especially in the first years Panhuysen experimented with that aspect, working with stainless steel, bronze, nylon wire and nylon rope, silk, sisal and dental floss. Some of those were single threads, others were braided; he also used wound strings. He found the more conspicuous materials generally to be less effective as a sound source. The material can also have an effect on the perceived pitch — bronze strings tend to sound lower than those made of steel.

The gauge of a string is important for pitch, but is also related to the amount of energy needed to make a string vibrate. The

thicker a string the lower its sound, and the more energy is required to play it.

Tension influences pitch, but does so to far greater effect in short strings than in long ones — beyond a length of three meters (approximately) it is hardly possible to tune strings by using tension.

The length of a string also determines the pitch. In longer strings, however, the fundamental is practically below the hearing range, and the harmonics become prominent. In addition long strings allow the player to change and shift the nodal points, thereby making sequences of harmonics audible. Just like the harmonics played on a violin and reminiscent of overtone singing, such sequences can be shaped into melodies.

Panhuysen found that the music he appreciates most in the strings are continuous sounds that are rich in harmonics. He makes this music by brushing with resined hands along the strings. To attain the optimum result he eventually settled for steel wire of a gauge between 0.3 and 0.6 mm. Strings that are thicker don't produce the same riches of overtones. Steel proved to be more reliable under tension than, for instance, bronze. (Figure 1)

Vibrations in strings have a transversal and a longitudinal component. In long strings the former are visible as standing waves, of which one can easily see the nodes and curves. Because of the elasticity of these thin wires (making contraction and expansion occur), there are oblique components as well, which get translated into irregular shapes of the curves. "A vibrating string," Panhuysen says, "circumscribes a volume which is defined by the nodes and the curves, and which changes in response to my playing." Sound, then, is directly translated into an image. This makes the strings ideal material for Paul Panhuysen to work in an area where the two meet.

THE SPACE

The spaces in which Panhuysen builds his installations are effective on a visual and a sonic level, too. First and foremost, every new space challenges him to a response in relation to its architecture. He always keeps on the lookout for spaces in which he has not yet made an installation, and which have exceptional visual properties and proportions. Especially the latter are of consequence for the acoustics. (Figures 2 & 2A)

By making a long string installation he turns an architectural space into an instrument, and both the musician and the audience are inside it. The entire space becomes the work – not just because it sounds in its entirety, but also as a result of the image presented.

The work is therefore partly an existing, given situation. It is a way of working that Panhuysen likes. "On the one hand I choose a certain space because its characteristics make it suitable for an installation," he says. "On the other hand, because these surroundings are fixed, the installation has to be grafted into them. This enables me to establish a strong relationship between my work and reality – the opposite of what is customary in art: white neutral spaces in which nothing can detract from the pieces. The gist of applied art is having to work within the limits of what is given."

Working in spaces with different geometric forms has given Panhuysen experience of relationships between architecture and acoustics, "I have often come across architecture that reveals acoustic properties of a space – such as a dome, a circle or a cube.

Fig. 2. 'Field of Sounds', Municipality Dock, Tacoma, 1993

A characteristic example of a site-specific long string installation.

Photograph: Paul Panhuysen ©

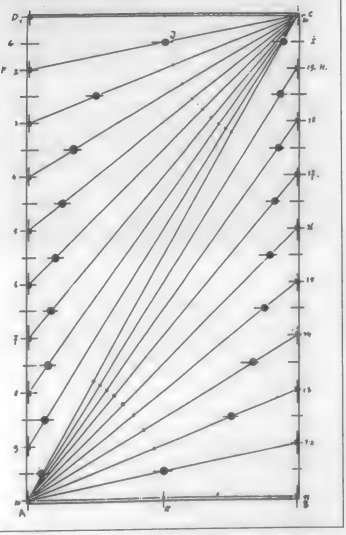

Fig. 2a. Diagram of the floor plan of the long string installation 'Field of Sounds', indicating the strings stretched between the wooden pillars, the placement of the barrels (big black dots) on the floor and the turnbuckles (small black dots) on the strings.

The short parts of the strings were nylon chords, the longer parts steel wire.

Diagram: Paul Panhuysen

If you talk near the wall of a circular space, the sound goes around and is understandable for everybody who also stands near the wall independent from the distance to the sound source. Under a domed ceiling (regardless whether that is a hemisphere or a parabola) all sounds occurring in the space are reflected to one spot on the floor. In a cube sound becomes a sphere – there are places that are almost silent, in the corners."

"In a space that I appreciate I can show how art hinges on defining the relation of the individual in regard to the social and material context in which he exists. For me that is basic in art. I neither express my individuality per se, nor that environment as such – it's the relationships between these two and the proportions that are pivotal. These have to be such that my being there makes sense, as much as what can be expressed by means of that space. It is a site-specific instrument, it has to be tailor-made. Whatever I bring to it must be related to the proportions of the space. They define the length and the direction of the strings, which in turn determine the resulting sound – in other words, through the installations I can express what visual art, architecture and music have in common. The installations enable me to analyze a space, and to make features of it visible and audible that one wouldn't normally experience."

RESONATORS

In the first long string installations the sound of the strings was amplified through pickups connected to guitar loudspeakers. Later on, however, the installations became predominantly acoustic. "I saw the space as a sounding body with the audience inside it. That made me start to use resonators – which are in fact acoustic loudspeakers. Most of the time they are objects to which a vibration is transferred in order to render it audible. To all effects and purposes they are loudspeakers. Functionally there is no difference between the system of pickup, amplifier and loudspeaker of an electric guitar and the sounding body of an acoustic guitar."

"Resonators may come in all kinds and sizes. Among the first that I used were empty paint drums and cubes made of thin sheets of wood with holes. These were rather bulky and didn't always have a relation to the situation they were used in. For a concert on a small installation in Japan in 1997, entitled *Juicy Lucy*, I used small soda-cans of aluminum, which were surprisingly effective. It is also possible to use parts of the space as resonators – glass panes; wooden, metal and plasterboard walls; roof constructions."

"Size and volume are directly related to the range of pitches that comes through. The materials used have a strong influence on the overall sound. Styrofoam does the job very well. I had similar experiences with a sheet of lead, slate and balloons – which all sounded surprisingly good. Aluminum produces a resonance that I can only describe as idiosyncratic. It has a complex timbre that is entirely its own, with many peaks at separate frequencies. Birds love it."

"Resonators do not need to have enclosed volume. I often work with sound plates made of sheet metal or plywood, which may be straight or bent. When you bend them they undergo variations in tension and describe a volume, which again affects timbre and pitch – much like happens when you play the saw. When they remain in one position it is the differences in size that will cause differences in the sound, which means you can tune them. The method is similar to strings. Only where in strings one would have to work with proportions of length, in the plates it will be proportions of surface measure. Volumes can be tuned proportionally, too. Regardless of whether resonators in a long string installation are two or three dimensional, they are also a sculptural element in it."

"It may happen that I don't want any visual extras in an installation. In that case I will use electric resonators, such as piezo pickups. There is a noteworthy parallel between strings and electronic equipment. Just as through equipment you can make the vibrations in a string audible and alter them, strings can work as filters and as an acoustic reverb. This has resulted in quite a number of hybrid projects, such as *Tom and Jerry* (with Jerry Hunt) and *The Galvanos* (see below), in which long strings are incorporated into effects

Fig. 3 'Circus', Ancien Cirque d'Hiver, Liège, 1985

In this installation the strings were kept under tension by ten sacks of different weight, hanging at equal distances in a circle approx. one foot above the floor.

Photograph: Pieter Boersma ©

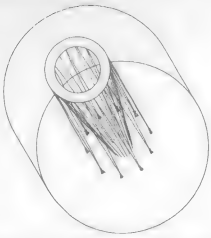

Fig. 3a (right). Diagram of the installation 'Circus': Johan Goedhart

equipment as sound processing tools."

TENSION AND WEIGHTS

In order to generate sound from a string a minimum of tension is needed. It goes without saying that there's also a maximum to the tension a string can have. Paul Panhuysen uses different methods to stretch the strings in his installations, but he has to work between those limits. "Depending on the thickness of a string it starts to produce sound when the force applied to it is two kilograms. Seven kilograms is the upper limit that I have ever worked with. Beyond that I would have to use thicker wire, which is far less responsive to brushing. In installations that are primarily intended to be played, the strings will be thin wire. To arrive at the right tension I use spring balances that register the force pulling at a string very precisely. Elastic strings would be less sensitive to such forces, but you can't keep tension as constant as with steel. As sound sources they are quite unpredictable in the way they behave. And I do prefer strings that are reliable in at least some respects."

"There are various means to apply tension. Belgian turnbuckles are ideal for this purpose. Farmers use them to stretch wire around pastures. They allow one to shorten strings for several meters by winding them on a spool inside the device. One can also apply tension by leading the strings over pulleys and attaching weights to them. It is a system that I have used from time to time. In an installation in the Ancien Cirque d'Hiver in Liège (the first to include weights) I had strings run from a small circle on the ground to pulleys on a large ring that was suspended from the ceiling. On the other end the strings were tied to sandbags of proportionally different weight hanging just above the floor." (Figures 3 & 3A)

"Some of the weights were heavy readymades, such as a grand piano that I hung on sixteen nylon strings from the gallery in the entrance hall of a cultural center in Budapest. We had placed the instrument on a platform that we removed after putting tension on the strings. We played the strings on which the weight was hung."

"In the Old Pension Building in Washington DC, the National Building Museum, I made an installation with two grand pianos of which the sound boards served as resonators. I hung the pianos on sixteen ropes from the balustrade on the fifth floor. They were to hang on either side of a basin in the center of the floor. This caused something of a problem. You can distribute the tension on the strings evenly by hanging the object in the middle of the points from where it is attached. The more you deviate from that, the greater the differences in the forces at play on each individual string."

"We solved that by balancing the pianos on a cone, very much like an elephant in a circus standing on one leg. Each piano rested on a frame to which the ropes were fastened on which it hung. In this frame we placed long dowels as bridges. The strings that we played ran over the top of each dowel under each piano through a hole in the frame until the sound board." (Fig. 4 & 4A)

"I like to use pianos. In the *Sonambiente* sound art festival in Berlin I laid a standing piano on its back, and attached wires to its strings after removing the panels. One of my reasons for using this particular instrument as an image is that it's so closely associated with classical Western music. Both the piano and the violin represent an entire world – a stable world, in which

Fig. 4. 'Two Suspended Grand Pianos', Great Hall National Building, The Old Pension Building, Washington DC, 1990

Photograph: Paul Panhuysen ©

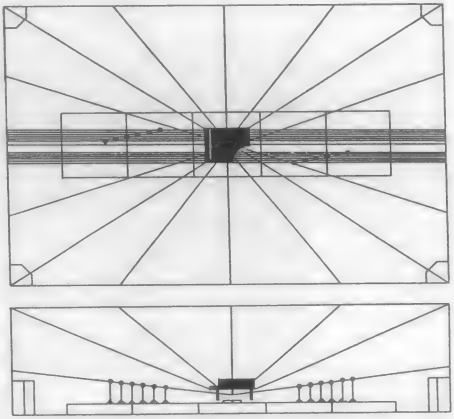

Fig.4a. Proposal for a long string installation for the exhibition 'Sonambiente' in Berlin, 1996

This installation was not realized. The diagram clearly shows the position of the dowels under and against the soundboard of the piano. The dowels were to function as bridges for the strings sounding in this installation. This construction was similar to the one that was used in the National Building Museum.

Diagram: Paul Panhuysen

Fig. 5 (above). 'My Home is Your Home', Construction in Process IV, Lodz, 1993

Photograph: Paul Panhuysen ©

Fig. 6 (right). 'Spider', Het Apollohuis, Eindhoven, 1983

Detail of an installation showing relays, triggered by motion sensors, hitting the strings with small bamboo sticks.

Photograph: Peter Cox ©

everything is fixed, in which people cherish tradition rather than anticipate what lies ahead. It is an instrument with symbolic value. If you start putting it into motion, present it in a state of precarious balance (as I did in Washington), or floating in the air (as in Budapest), there is really no need to explain to people what exactly that might mean. The ground may not have been cut from under its legs, but they have become quite useless."

There is considerable variety in the objects that Panhuysen may use both as weights and for the meaning they add to an installation in relation to the place it is constructed in. In his contribution to the *My Home Is your Home* exhibition in the Polish city Lodz these weights were old carts formerly used for hauling concrete, heavily crusted with the residue. "They seemed to lift off into the air in a fitting reference to the theme of the event – they seemed to exist more in a dream than in reality." (Figure5)

An installation in which the weights integrated a formal and a metaphoric response on different levels was the one he built in the municipal theater of the Dutch town Helmond, Het Speelhuis. The floor plan of the place is hexagonal; in the way the concrete ceiling has been molded and painted the venue has been made to look like a circus tent. The installation consisted of two oil drums hung above each other, both on six strings stretched from the ceiling. Not only was the strict hexagon broken into a polygon of twelve angles, the space looked as if a hot air balloon had been placed in it – conceptually it had been turned inside out.

TUNING SYSTEMS

Panhuysen tunes his installations by using strings of which the lengths are in a proportional relation to each other. Several of these are tuned in the Pythagorean chord which is based on the ratio of 6:8:9:12. "It's a numerical and proportional relationship of considerable symbolic value. It was the first theory of Western music. In his treatise *Number Made Audible* the medieval philosopher Boethius relates how Pythagoras once when taking a stroll in a forest heard a harmonious sound coming from a smithy where four people were hammering on an anvil. According to Pythagoras and Boethius the different pitches were the result of the different weights of the respective heads of the hammers, which turned out to be in the proportions of that ratio. From 8 to 9 there is a difference of one whole tone. Between 6 and 12 the interval is one octave; between 6 and 8 it is a perfect fourth; between 6 and 9, and between 8 and 12 it is a perfect fifth."*

"Apart from that Pythagorean chord I have begun to determine the length of the strings according to various modulations of integer sequences and site-specific geometrical proportions. In the former the steps by which each string is longer than the one preceding it, are numerically progressive. In the latter the length of each string is derived in relatively simple ratios from the first. If that is taken as 1/1, the second may be 1/2, the next 2/3, then 3/4, after that 4/5, and ending with 5/6. The more strings the higher the ratio. Many other variations of systematic intonation are possible. I keep exploring these possibilities. New tunings always offer new rules for each new installation. The rules are the game."

There is another method through which Panhuysen arrives at a pentatonic tuning (see the box, next page). Taking the full length of the first string as 3x3x3x3 he alternately subtracts and adds the result divided by three. "These calculations result in a harmonic and proportional series of the lengths of the strings. A hexatonic

*Editor's note: Boethius' story doesn't truly reflect the acoustics of the situation, since the pitches resulting from the anvil-strikes would depend on various factors other than the relative weights of the hammers. The Pythagorean ratios do, however, apply to relationships between string length and pitch (other variables being equal), and it is this that is reflected in Paul Panhysen's long-string work.

scale can be arrived at through this method by multiplying 81 with 3 again. The calculation then starts with 243. Trying to achieve a heptatonic scale along these same lines does not work, as the results will cross the boundary of the octave."

81
81–1/3x81=54
54+1/3x54=72
72-1/3x72=48
48+1/3x48=64

The calculation may be reversed as follows:

81+1/3x81=108
108-1/3x108=72
72+1/3x72=96
96-1/3x96=64

This results in the following octave:
96 – 81 – 72 – 64 – 54 – 48

PLAYING THE STRINGS

The most effective technique for playing long strings is 'brushing', according to Panhuysen – stroking the strings lengthwise with hands and fingers. "This technique, which was already known in the Middle Ages, is also used by Jim Burton, Terry Fox, Ellen Fullman and many other artists, such as Kazue Mizushima, who wears gloves while playing. At first I avoided this technique, because I saw it as the trademark of people who already used it. I found that playing the strings with sticks and mallets, the generated sound is very short-lived. Bowing them is only effective at the farthest ends. In time I changed over to brushing, as it is silly not to use what works best. There are people who play the string by taking it between thumb and index finger. I cover my arms with resin from the fingertips to the elbows. This way I can play several strings in one movement. You do have to take care to keep the pressure even and light, and to have as little skin as possible touch the string. It is the best way to coax overtones from the strings and it results in a virtually continuous sound."

"One extraordinary aspect of long strings is that they correspond with Leonardo da Vinci's ideal of continuity in sound and music. He considered it a disease of music that a tone starts to decay the same moment when it's generated, and thereby threatens to break the music into fragments. The longer the strings are, the slower they respond to changes in playing. A long string installation is an excellent instrument to make timeless music on. Melody and rhythm are methods by which time is hacked into pieces. There is a difference in experiencing a tune that repeats itself and an never-ending moment of sound. I prefer producing an ongoing complex sound in which ever different harmonics arise. The long string is a good instrument to make that happen. It is less than ideal for playing quick melodies. I don't have need for those, anyway, when I want to give voice to a space – for that a continuous sound is needed. The way it changes one's perception of time is a significant part of the total experience. What this hinges on is the difference between being and trying to achieve something. A feeling of existing outside of time, where there is no difference between slow and fast. It's important to get rid of time."

Playing an installation is still largely experimental. Panhuysen does not want to rehearse extensively before a performance. "For me a concert is an investigation into the characteristics and the possibilities of that particular instrument, and it ends when I feel I have completed my explorations of the instrument. The audience is a witness to my own discovery of what I can do there. This is much better than showing off one's prowess. Of course there is always the risk that the audience will be the witness to a lack of possibilities in that specific instrument – which is still more interesting as an event than a concert in which the element of chance has been ruled out. On the other hand I have accumulated the experiences of around 300 installations."

"An installation that is easy to play may consist of four strings at least and twelve strings maximum. The strings usually run parallel to each other. A pathway is left free in the middle so that I can walk in between them. They are stretched at such a height that I can easily reach them with my hands, between 1.2 and 1.5 m from the floor. I walk through an installation with an alert mind, trying to remember on the basis of my movements at which spots I can produce the most complex sounds. The result is a natural choreography between the strings."

"I have built a considerable number of installations intended specifically to be played rather than as a response to the formal and acoustic properties of a space. That may depend on how long an installation will remain at a place. If it's to be exhibited for some time, there will be more emphasis on the visual aspect; and I can have it played by mechanical musicians (automatons, see below). As these automatons can be placed at any height off the floor, I am not restricted in the angle or the height at which I stretch the strings, in the way I would be if I am playing the strings myself. In other words, even in such sound art pieces sound and image can to some extent be developed independently. It may also happen that I build two installations, one in which I respond to the space, and one that I will play in a concert and use in workshops. The latter is for sharing the experience of playing with others, which is not a question of technique but of attitude – you have to let the instrument determine what you are going to hear, and not try to control what sounds it will emit. Not try to subdue it, but try to find out what the strings can do."

"For people with a huge ego, people who always want to assert themselves, this is extremely difficult to accomplish; they can't make music in a natural, self-effacing way. Generally speaking, the qualities that I want to develop pivot around gaining the best possible insight in the context in which I exist. That's what it boils down to – trying to achieve a balance between yourself and your surroundings. You can't achieve this when you are bent on demonstrating virtuosity, but only through making the urge to assert yourself subordinate to a totally self-evident relation with what exists around you, human and non-human. This doesn't mean you have to cease to exist, but that you stop seeing everything that lies in your way as an obstacle that should be surmounted. That involves serious training. Playing long strings can get you there. Especially children playing them can lose themselves in the sounds and the movements they make. I have found that this makes people feel completely happy in time and space."

AUTOMATONS

Panhuysen's use of automatons in long string installations evolved quite naturally. An installation that is on show for a length of time must necessarily produce sound, as that is an essential element of it. Automatons can be mounted on the floor, on stands, they can be hung from the ceiling, or even mounted on the strings themselves. The first worked on relays which made thin bamboo sticks hit the strings, and switched off above a certain level of sound. Subsequent automatons have often been triggered by motion sensors, light sensors or timers. Some of these respond to actions from the audience. (Figure 6)

The sound can be generated by small electric motors spinning rubber bands that hit the strings and draw a continuous sound from them, quite like bowing. Panhuysen still uses them, but mainly for playing automatic orchestras of readymade instru-

ments. Other devices that he has built to excite the strings are motors with a crank moving back and forth, little balls hanging from threads that start jumping when the latter are set spinning, and resined wheels turning lengthwise over the strings. (Figures 7 & 8)

Many of the motors are in fact electromagnets. These can also be attached directly to the strings, to make them vibrate through their pulse. That has led to The Galvanos, an instrument which expresses Panhuysen's views on the concept of the loudspeaker (or resonator). The (unattainable) ideal that loudspeakers exemplify, is that of a perfect reproduction of sound through sophisticated equipment, which translates variations in electric current into motion (of cones or membranes, depending on what system is used). In The Galvanos the translation is done by galvanometers connected directly to the left and right loudspeaker outputs of stereo equipment. The meters register the minute differences in currents of audio signals that would normally have been fed to loudspeakers. Each meter translates these variations into vibrating motions of its pointer. Fastened to the base of the pointer is one end of a steel wire, the other end being connected to the strings of a string instrument or a long string installation.

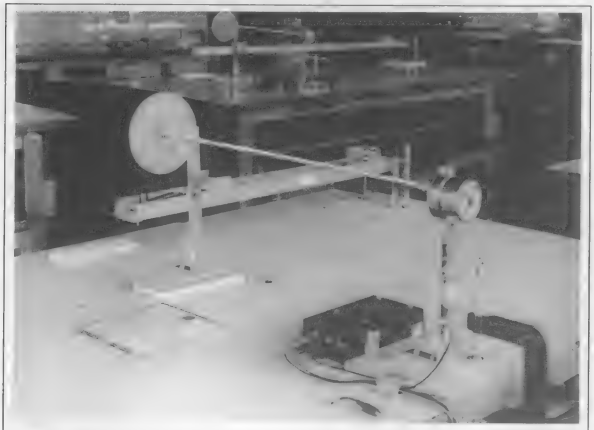

Fig. 7 (above). 'A Class on Mechanical Acoustics', Twelve Environments, Akasaka Junior School, Tokyo, 1996

Marbles running up and down two parallel strings produced the sounds of this installation.

Photograph: Peter B. Kaars ©

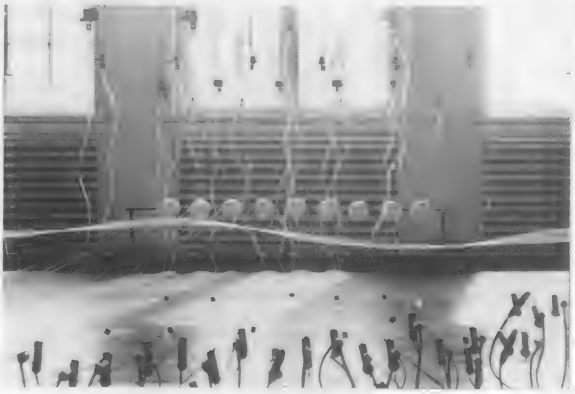

Fig. 8. 'Julius Gast', Künstlerhaus Bethanien, Berlin, 1985

Rotating nylon wires, attached to small motors at the top and with little weights at the other end just above the floor, hit the strings in this installation.

Photograph: Pieter Boersma ©

The Galvanos constitute an automaton that acts as a filtering system. The galvanometers interpret the signals, translating fluctuations in electric current into motion. The wires, from their part, are sensitive to certain sounds and frequencies but less so to others, amplifying and suppressing these respectively; they also add echo. Each string they are attached to accommodates the incoming vibrations to its specific tuning. In this playback process the sonic character of the original signal has changed completely. Voices sound like musical instruments. New melodies emerge as others disappear. Only the global structure and some characteristic details of the input remain. (Figure 9)

An early application of these galvanometers was in a mechanical long string orchestra, built in 1989 for the exhibition *L'Europe des Créateurs* in Paris. Strings stretched in parallel lines in a frame were played by balls hanging on threads that were spun around by electric motors. The signal was transmitted to galvanometers, which in turn made a separate set of strings vibrate that were attached to metal sheet resonators. (Figure 10)

THREE PARTITAS FOR LONG STRINGS

Recorded in 1997, the CD Three Partitas for long strings is Panhuysen's second album exclusively devoted to long string installations, the first (a three-LP box-set with book, now out of print) having been released in 1985. This CD documents the experience Panhuysen has accumulated concerning long strings. Two aspects were of central interest to him: different tunings and density of sound. He made an installation in the large space of Het Apollohuis, stretching four strings lengthwise and attaching them to the wooden wall on the far end, which served as a resonator. He did not use automatons or electric amplification. He played the strings by brushing them, walking back and forth at an even pace. His aim was to make his playing as continuous and even as possible. For each Partita he recorded his playing four times, superimposing these recordings over each other and listening to the earlier recordings over headphones whilst playing. The total sound of each Partita was produced by sixteen strings.

The three Partitas differ in the systems according to which the strings were tuned. These tunings can be regarded as the score for each piece.

In Partita I all strings were of the same length and therefore of the same pitch.

In Partita II and III each string was tuned differently, and after each take they were tuned to new pitches:

In Partita II the tuning was numerical, according to the following series: $S_1=x$ $S_2=x-y$ $S_3=x-2y$ $S_4=x-3y$ ... $S_{16}=x-15y$; in which S_n is each actual string, x is the string at full length, and y is 25 cm.

In Partita III the tuning was proportional, according to the following series: $S_1=1/2x$ $S_2=2/3x$ $S_3=3/4x$ $S_4=4/5x$ ... $S_{15}=15/16x$ $S_{16}=x$; in which S_n is each actual string, and x is the string at full length.

The result is a considerable difference in overall texture between the three pieces. Partita I is almost monolithic, with harmonics (which appear in the periphery) bouncing between the fifth and the octave. Partita II is wildly dissonant and irregular, with tonal centers emerging and ebbing away at random, with tremulous and throbbing sustained tones, a wide variety of timbres, discreet semitonal slides, and with sonic apparitions shimmering through unearthly harmonies. Partita III has a steady tonal center around which clusters build up, expand and contract, from which chords emanate in slow progression; dissonances, when they occur, proceed from clusters in harmony with the central tone.

Fig. 9 (above).

'Music is Number made Audible: Pythagoras, Galvano and Stalin', The Kitchen, New York, 1996

Behind the amplifiers a group of galvanometers is partly visible, with their pointers and the strings running from the latter to the strings of the long string installation.

Photograph: Paul Panhuysen ©

Fig. 10 (right).

'The Mechanical Long String Orchestra', L'Europe des Créateurs/Utopies 1989, Grand Palais, Paris, 1989

Detail of the mechanical musicians — motors, programmed by timers, with a nylon chord and a wooden ball rotating between the strings.

Photograph: Paul Panhuysen ©

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This is the seventh in a series of illustrated articles from Robin Goodfellow now appearing in *Experimental Musical Instruments*. Each article presents ideas for musical instruments simple enough to be made by children, with accompanying culture and lore.

LAUDABLE LAUNEDDAS AND OTHER REEDY FOLK

Article and illustrations by Robin Goodfellow

A Sardinian Launeddas
After a photo in Andreas Fridolin Weis Bentzon's "The Launeddas, a Sardinian Folk Music Instrument"

Launeddas players will never be rich, but will always have high ethics and outstanding morals, according to an old folk legend* in Sardinia, an island near Italy, where the instrument was played extensively until radios were introduced to the island. Many launeddas players may have lived up to this exacting standard, but it is also true that this deceptively simple, triple cane affair of a reed instrument has been the instigator of extreme examples of jealousy, chicanery, secretiveness and downright skullduggery! A launeddas is a set of three long cane pipes of differing lengths. At the blowing end of each one there is a slit in the cane creating a reed which, when inserted fully into the mouth and blown upon with great vigor, will produce a strong tone.

Even before the conception of any individual instrument, a launeddas maker in the old days who knew the whereabouts of a source of suitable cane (a clump growing beside a road, for instance), would have jealousy guarded the information. The making of the instruments themselves was perfunctorily passed on to students, whose parents were paying for the process. But the inner secrets were traditionally given by a master only to some immediate member of his family, and then only on his deathbed. In this inefficient and somewhat unpredictable manner, many secrets were lost.

The idea of producing a reed by cutting a slice from one end of a cane, with one side remaining attached, is found in many parts of the world. Known by many exotic names, such instruments are made of rice stalks, straw, the trunk of a small palm tree in Colombia, or hollowed-out wood. In Latvia and also Lithuania, the instrument is used as a decoy in hunting. Frequently the instruments are paired or occasionally tripled, as with the launeddas, being bound in some cases with tar, or more frequently by being tied together with string, sometimes loosely, sometimes tightly. They are played with circular breathing. Many expand at the end in a bell made from cow or other horns. Only in Sardinia, however, to my knowledge, has the full extent of the social shinnanigans surrounding the teaching and the playing of the instrument been recorded.

Before the infiltration of radio and recorded music into this agrarian countryside, the launeddas player was the important, necessary functionary without whom there could be no wedding, funeral, church procession, Saturday night show-off dancing of young men or Sunday afternoon couple dancing (under strict chaperonage) by which the fabric of the community was continued. Small wonder, then, that these artists had an exaggerated sense of their own importance! The nature of the business was quite competitive. One small village couldn't be the sole support of a launeddas player. For this reason, in order to make a living, launeddas players were also trained as cobblers. By dint of mending footwear and also by traveling extensively between villages for festivals and dance occasions, a launeddas player could make a living commensurate with his level of playing. The better the musician, the more music he would play. Mediocre players spent more time mending shoes.

Shoes were important in a pedestrian society. When a master went to play an important function where he was prepared to show off the most intricately contrived, fully memorized *nodas* (melodic segments that make up the dances and compositional forms), he most often traveled by foot. In order to prevent his apprentices from hearing these treasured art forms, it was a practice to hide the student's shoes before setting out. A determined student, however, would find the shoes and sneak behind the master, hide in a place where he could hear the music, memorize it on the spot and return home much the richer! This would shorten the time before he would be able to set up on his own and steal valuable

* The legend relates that the Madonna was late coming home to take care of the Son, who asked where she had been. Mary replied that she had been delayed by the beautiful sound of the launeddas on the mountain. Jesus told her that it was merely the Devil tying to distract her and asked if she would prefer that such a thing did not happen again. She readily agreed and Jesus put holy wax onto the tip of the reed for tuning, instead of merely filing it down thinner. It was then determined that launeddas players would always be appreciated, but would never gain from their employment.

paying jobs from his master, which is why the master guarded his own means of support and why the student was so eager to have it.

Jealousy between master and student was insignificant compared to the rivalries that existed between artists! One master, not understanding why he had not had any requests for performances for a few months, discovered that a competing launeddas player had been spreading the rumor that he had died!!! (He was able to figure this out of course, because he had pulled the same trick himself a few years earlier on another player, according to reports.)

A simple idioglottal cane instrument

The fascinating social and musical history of the launeddas players has been researched by the Danish scholar, Andreas Fridolin Weis Bentzon. His article "The Launeddas, a Sardinian Folk Music Instrument" (the source for much of the launeddas lore given here) is well worth reading for anyone interested in such things.

The rest of this article will be devoted to methods for creating instruments on the same principle as the slit reed of the launeddas.

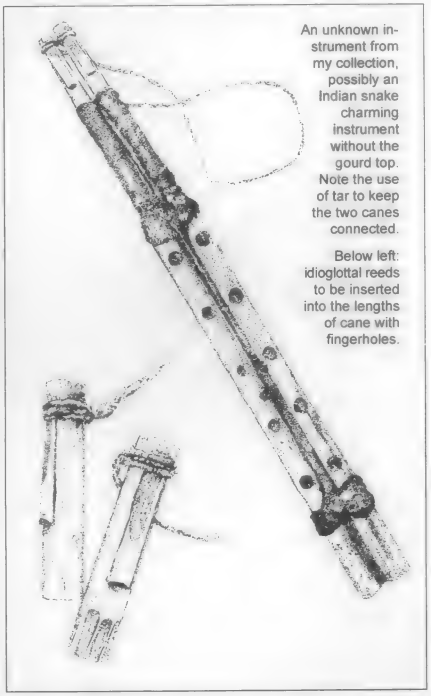
It is possible to make a launeddas-type instrument from a soda straw. It might take a bit of practice, but the results are quite surprising. I recommend starting with a large supply of straws for experimentation. When I set out to learn the skill myself, I took a few hundred up on a mountain overlooking the ocean and cut for several hours until I was satisfied that at least 80% of my straws would play. This is important when working with children, because laws of sanitation do not allow the maker to test the playing of the instrument before giving it to the child. Older children can, of course, make their own.

I start with a wide-diameter straw (about a quarter inch diameter; Stay Bent straws made by the Winkler company are very good*). I pinch it about an inch from an end, and make a small, thin cut, sharply tapered at the beginning, then parallel to the end. (See illustrations, next page.) Experiment with local supplies and see what works for your own reed-cutting style. I cut in at an angle and then quickly change the direction of the cut to parallel the side of the straw. Flick the tip of the pointy end up with your thumbnail and stretch it back a bit so that it is open slightly. If it doesn't play (I'll explain the playing technique in just a moment), scrape the reed with your thumbnail and again bend it back.

With the reed now clamped on and replaceable, we have the modern clarinet, a young member of the single reed family that can look back to its idioglottal origins.

For an instrument of this sort to play properly, the tube that is the instrument's body must be blocked, not open, at the mouthpiece end. The original launeddas is closed at that end with the natural node of the cane. As the common plastic soda straw has no natural node at the end, I searched for some common material to serve as an end-stopper that would be safe for children, deciding that anything put in the end of the straw could be a choking hazard. Then I realized that the very safest thing for the child to put in the end is the child's own tongue! This works well.

To play the instrument, the entire reed-portion of the tube goes in the player's mouth. I have the kids pretend they have lipstick on (even the boys) and when they close

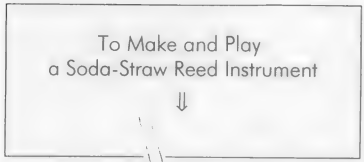


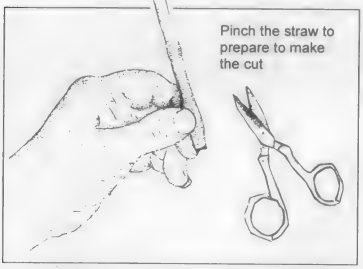
An unknown instrument from my collection, possibly an Indian snake charming instrument without the gourd top. Note the use of tar to keep the two canes connected.

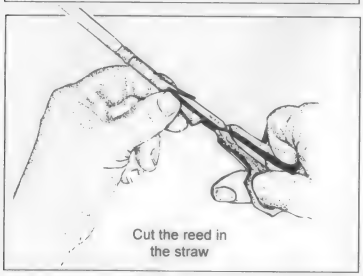
Below left: idioglottal reeds to be inserted into the lengths of cane with fingerholes.

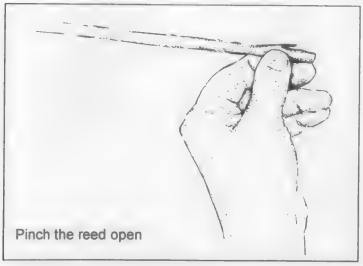
their mouth over the reed, they will make a red mark below the beginning of the reed. Then they make sure their tongue is closing the end ... and BLOW! If there is no sound, the problem frequently is that the child has held the tip of the reed down inside his/her mouth and the reed is no longer free to vibrate. The cure for this is to remove straw from mouth, have the child flick the end of the reed to free it, and try again. Check to make sure the child's tongue is closing the end.

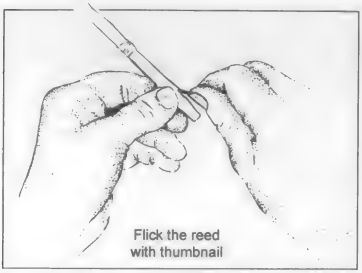
* See the footnote on page 39 for sources.







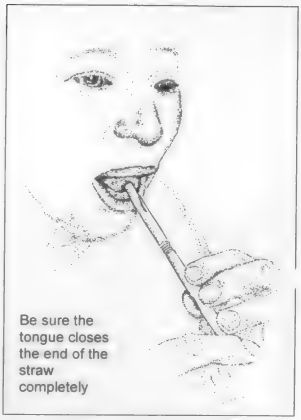


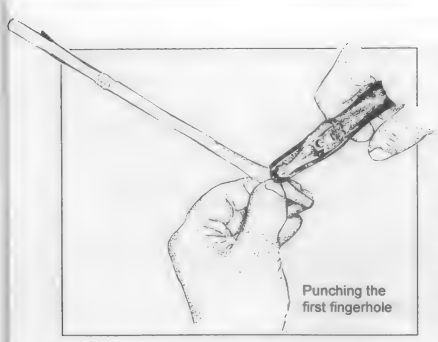


If the reed still does not play, there are two more solutions. Cut another reed or change playing position. If straws are in short supply, just cut off the end, reed and all, pinch and start over. If you suspect that the reed is fine and the child just isn't getting it, then have the child put her/his mouth over the reed horizontally, covering the end with a finger. (See illustration) This unusual technique, first communicated to me by our editor, Bart Hopkin, appears to be a variant of the instrument found in many parts of Africa and only in one country outside of Africa, in the *caña de millo* of Colombia. Held like a flute in transverse position, it is sometimes easier and definitely a safer method for many children. If a child should be walking around playing the instrument, which I discourage in my classes, a horizontally held instrument will not cause problems if the child trips.

If this still doesn't work, well, console yourself that not all children will get it immediately. Perhaps you are working with a group too young or you need to go back up the mountain and cut a few hundred more reeds until you know they will all play. Do experiment with the width and length of the cut, the angle beginning the cut, the type of straw and the placement of the cut in relationship to the end of the straw.

When you get an easy-blowing instrument with a good tone, pinch near the bottom of the straw and force a paper punch to punch a part of a circle in the straw, making a finger hole. A *V*-shape can be cut with scissors, if there is no hole punch, but the shape is not as easy to play and can weaken the straw if the hole is too big. Try playing with the hole covered and then with it opened. If both tones sound, then keep adding holes and testing until you can no longer create new notes with new holes. Six is the most practical number, but if your instrument balks at going that far up, there are many pieces that can be played on fewer holes. As with all the instruments of the woodwind family, of which this is a member, making the hole smaller or closer to the bottom end will give lower notes. Making the holes larger and higher up on the tube will give higher notes. A hole that is too large can be made smaller by applying clear adhesive tape to the top





Punching the first fingerhole

Two instruments are possible. Three are traditional. Any more will lead to lunacy.

The combination of soprano and bass sliding straw

or bottom of the hole, depending on the problem.

In order to replicate a launeddas, one would need to play more than one straw at once. This can somewhat be accomplished by finding a spot on your tongue for each straw, being sure that your mouth closes well below the bottom of each slit reed, and blowing all three at once. That is the theory. The practice is that the laws of physics really don't seem to apply to these instruments! Two identical straws, with no observable difference in their reed design, at the same length, will play two completely different notes — not just a slight out of tuneness, but an unrelated fourth or something equally wild. One variable I have discovered is how far into your mouth each straw extends. Sometimes, however, the whole process feels as if it has stepped out of natural laws and into apprehensiveness of other forces with which the history of launeddas abounds. Theoretically, lovely triads should be attainable. At this writing, however, I have only accomplished a few — not enough to play any recognizable piece of music, but enough to be tantalized by the possibilities.

Another instrument that can be made from a plastic soda straw is the idioglot sliding bass clarinet. (Idioglot refers to the fact that the reed is cut from the same material as the rest of the instrument, not clamped, wired or attached with string as in more modern clarinets.) Sliding reed instruments are quite rare, but not unheard of. Here is a fun one made from straws.

Find a straw that will slip over another straw with enough space to slide easily, but tightly enough to keep air from escaping. One set that works is the Sweetheart milk straw slid into the end of a Stay-Bent or other flexible straw.* Make the reed on the Stay-Bent straw (the larger of the two). When it plays strongly, slide the smaller Sweetheart straw or equivalent into the bottom. If it still plays well, slide the bottom straw in and out of the large one for a slide-like sound. Now, if you want to take it a step farther and make a sliding *bass* clarinet, tape the small straw to the large one when it is extended as far as practical. Make sure that the seal is air-tight. Now take another Stay-Bent straw, or straw larger than the middle straw, and slide it onto the smaller straw. If you extend it out fully, it might fall off, so tape a string to the bottom of the smaller straw and let the larger straw out to its farthest practical point. Cut the string and tape it to the top of the bottom larger straw, creating a governor. (See illustration) Now, if you have used the Stay-Bent straw for the large straw at the bottom, extend its accordion-pleated section and bend it around for the Super Deluxe version with a handle! Pull the bottom in and out and you should be able to get at least an "um, pa pa" sound in the fake-tuba department. Now if you want to carry this further, punch three holes in the top of the instrument. (See illustration) When all three are open, you will have a soprano note, possibly a *mi*, or third note of a scale. When one hole is closed, a *re*, or second tone of the scale might be obtained. Two fingers down, two holes closed is the *do*, or first tone of the scale, as in a middle C on a piano. With these three notes, you may start "Mary had a little lamb, little lamb, little lamb"** and finish the song by closing the third hole, which throws the instrument down to the slide part an octave lower, for "its fleece was white as snow."

This process can be carried to absurd dimensions. A friend and I added one straw to another and another until they went entirely across a room. The final note before the whole thing collapsed was a strange sort of deep bleat that was satisfying scientifically, if not musically. The important thing to remember, if anyone is inclined to repeat this experiment, is that the joints must be very solidly taped so that each one is completely air tight.

I hope you have enjoyed this exploration into a straw-sized world of the launeddas.

(more) ⇒

*Stay Bent brand of straws are available from the Winkler company. Restaurant supply houses usually carry a good supply of straws. Ask your local dealer for Winkler and Sweetheart products or their local equivalents.

**The high note at the end of the second line of "Mary Had..." won't be available, so it will be the limited-range version of the tune you'll play, equivalent to the melody of "Merrily we Roll Along."

FOR FURTHER INFORMATION

Stanley Sadie, ed. *Grove's Dictionary of Musical Instruments.* London: Macmillan Press Limited, and New York: Grove's Dictionaries of Music Inc., New York, 1984, reprint 1995

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Robin draws from her extensive collection of musical instruments to provide illustrations and articles for EMI, where she has been a regular contributor for a dozen years. She is developing a set of notecards featuring her drawings of instruments, most of which have appeared on the pages of EMI.

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She would appreciate information about stories and legends of instruments, and ideas readers may have for simple instruments suitable for children to make and play.

AEOLIAN-BOW KITES IN CHINA

By Mitchell Clark

The history of Aeolian bows attached to kites, in China as well as in other parts of Asia, is an area of organology as understudied as it is extensive. An Aeolian bow is a musical bow designed to be sounded by the wind, and the term — cognate with "Aeolian harp" — is introduced here, as it is felt that it will be useful in describing this specialized use of a musical bow.[1] Since the status of these wind-activated sound-makers as musical instruments, on the one hand, or toys, on the other, has depended on various writers' viewpoints, Aeolian bows have only occasionally been taken seriously. What follows are some observations from various sources both Chinese and Western on the subject of Aeolian-bow kites in China, which will lead up to the process of making an Aeolian bow for a kite, described in a companion piece, "Making a *Fengqin*," translated from a contemporary Chinese book on kites.

Kites are of very great antiquity in Asia and have a wide distribution there as well as in much of the Pacific. An interesting speculation concerning the origin of kites is that they descended from bull-roarers, sharing with these sound-makers a sacred function that may still be found associated with kites in parts of their distribution (as well as being, quite basically, an object moving at the end of a string).[2] If kites with sound-makers are also of great antiquity — and we really don't have a way of knowing for sure, although sound-makers on kites are of wide distribution in China, Japan,[3] and Southeast Asia[4] — and if the bull-roarer ancestry were the case, perhaps such sound-making is the function of a kite which directly inherited the sounding function of a bull-roarer. Both a bull-roarer and a sonic kite are mysterious objects, producers of otherworldly sounds, bound to this world at the end of a string.

Accounts of the use of kites in late first-millenium BC China give them the name of *muyuan*, "wood kite." This term is found by the third century BC.[5] Perhaps the name *muyuan* refers to some vegetable material, such as plaited leaves, used to cover a wood

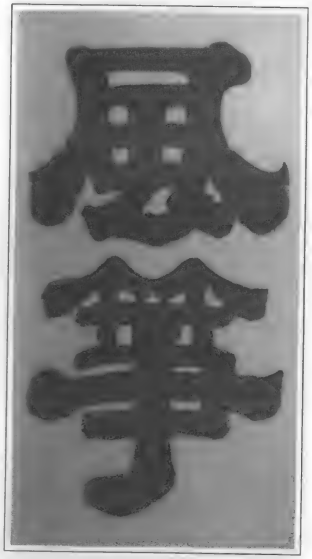
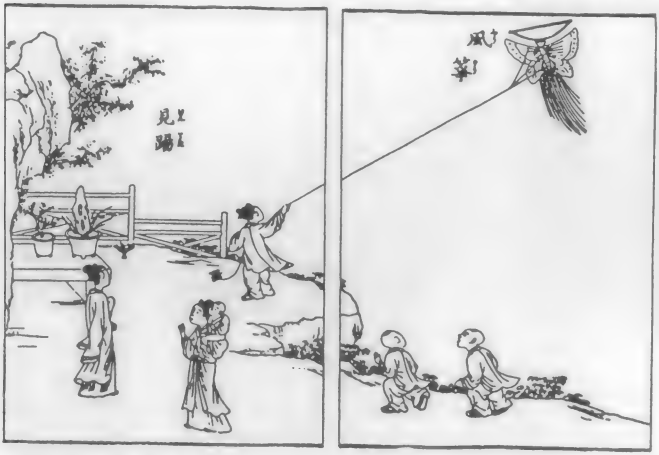


Figure 1: A pair of kites in the form of the ideographs "*feng*" and "*zheng*," manufactured by the Tianjin Kite Factory, China. (From Wang Qinian et al, *Fengzheng*; Beijing, 1986)

or bamboo frame,[6] or perhaps it simply refers to the frame. Paper kites (*zhiyaun*), made of paper covering a bamboo frame, came later, as paper was invented in the first century AD. The Chinese ideograph for *yuan* is also that used for the bird of prey,[7] and we find that the relationship of *yuan* (bird of prey) to *yuan* (the device that one flies at the end of a string) is the same relationship as English *kite* (the bird) to *kite* (the device).[8] Kites (the devices) are understood to have been introduced from East Asia into the West during the 16th century, probably by the Portuguese,[9] and the first recorded English use of the bird's name for the aerial device is from 1664.[10] We see that in both East and West, the graceful, soaring flight of the avian *yuan*/kite is the origin of the term for the aerial device. The kite genus *Milvus* is of Eurasian distribution, with *Milvus migrans*, for instance, ranging from Portugal to eastern China. This bird is known in England, where it is an occasional vagrant, as the black kite, and in China by the same name in Chinese, *heiyuan*.[11] The red kite (*Milvus milvus*) is the largest of the European kites, and interestingly enough, in light of the flight silhouette of the swallow being the prin-



Children flying a kite with an Aeolian bow mounted at the head of the kite, from an old Japanese woodcut.

cipal shape for the construction of kites in northern China, the red kite has a deeply forked, swallow-like tale.[12] As we shall see later, the swallow-shaped kite is that used to bear an Aeolian bow.

What might be considered the earliest known occurrence of a sonic or musical aspect to a kite is a military use, known through historical legend, from a battle fought in 202 BC, during the war between the Chinese kingdoms of Chu and Han. A large kite was constructed by the Han at the order of the general Han Xin, and one Zhang Liang, of both musical abilities and slight build, rode on this kite. From his vantage point in the sky, Zhang Liang sang and played Chu melodies on the flute, while the Han soldiers sang these songs on the ground. The music reached the Chu soldiers and managed to make them homesick as well as demoralized, forcing a Chu retreat. It appears that all kites in China, sounding or silent, were used solely for military purposes until the Tang dynasty (618-907).[13] Recreational kite flying became popular during the Tang, and Aeolian bows appear to have been first used on kites during that time. The kite-maker Li Ye of the Later Han dynasty (947-950) — from the brief Five Dynasties period which followed the Tang — was especially famous for his Aeolian-bow kites.[14]

A number of literary accounts of Aeolian bows come from the Tang dynasty, in the form of poetry on the subject. It is not surprising that during the Tang dynasty, when the world at large held such endless fascination for the Chinese, Aeolian-bow kites would receive attention in literature.[15] A famous example of this is a poem by the late-Tang poet Gao Pian. In the poem called *Fengzheng*, he speaks of an Aeolian bow attached to a kite:

> Of an evening, humming strings reverberate in the azure sky.
> Drifting on a breeze, notes of the scale come and go.
> The music is indistinct; a recognizable tune will appear,
> Yet, with a gust of wind, it becomes a different melody.[16]

During the Tang dynasty, the word *fengqin* ("wind *qin*") is found as the name for the Aeolian bow attached to a kite. One Tang-dynasty mention of *fengqin* is in a poem of that name by Guanxiu. The second line of this poem — "one branch of green bamboo, four strings, wind" — would seem to function almost as a parts list for the Aeolian bow itself (and is sure to include the necessary ingredient of wind).[17]

The terminology used for Aeolian-bow kites in China would be a study in itself. Many of the Chinses terms associated with the Aeolian bows used on kites can also be found with applications to other musical instruments, sound-makers, or non-sounding devices. Although the topic of the inter-relationship of Chinese sound words and musical instrument names can only be briefly touched upon here, the following should convey something of the richness and complexity of the Chinese tradition in namings for sounds and, by extension, for musical instruments. First of all, *fengzheng*, a term which we'll find with several applications, is the modern general term for a kite (see Figure 1). The first of the two Chinese ideographs which form this term, *feng*, meaning "wind" or "breeze," is (at least in this context) straightforward. The second ideograph, *zheng*, is most commonly encountered as the name for a popularly known Chinese zither (also called *guzheng* in modern times). But "*zheng*" is also an echoic (onomatopoeic) word for the sound that instrument makes, and is therefore the source of its name.[18] In that and other instances, "*zheng*" is a word descriptive of, variously, a twanging, buzzing, or humming sound. As an echoic word, *zheng* is sometimes found as a reduplicative, *zhengzheng*.[19] An early account of the *zheng* zither in a second-century AD dictionary relates that the *zheng*'s

Figure 2: A swallow kite, with a three-string *fengqin* attached to its back, made by Zhao Kun, Beijing, China. (From Wang Honxun, *Chinese Kites*; Beijing, 1989)

"strings are tightly strung and sound *zhengzheng*."[20] Reduplicatives which have been used to describe the sustained hum of an Aeolian bow on a kite are *chengcheng* and *wengweng*,[21] and an impressive compound describing the *zheng*-ness of the Aeolian bow's sound is *zhengmingsheng* — "*zheng*-voice-sound."[22]

The earliest use of the term *fengzheng*, referring to a sound-maker producing a "*zheng*" sound in the wind, appears to be from around 100 BC, as a name for windbells.[23] That "*zheng*" may be considered echoic of the collective tinkling of many small bells sounding in the wind makes sense, and perhaps it was such a collective tinkling-sound use, rather than a humming-sound use, that was in the mind of the framer of the term *fengzheng* for these bells.

The term *fengzheng* can be found used for the Aeolian bow attached to a kite — a perplexing naming as *fengzheng* is also the modern word for the kite itself. This use of *fengzheng* for the Aeolian bow is found in Arthur C. Moule's 1908 publication *A List of the Musical and Other Sound-Producing Instruments of the Chinese* (and subsequent publications quoting Moule, of which there are quite a number[24]), but I have not (yet?) encountered any Chinese usage unambiguously connecting the word *fengzheng* with an Aeolian bow, rather than with a kite which may or may not bear such a bow. But, as we have seen, kites originally had another name — *yuan* (as in *muyuan* and *zhiyuan*) — and the long-standing popularity of Aeolian bows on kites does suggest that the modern term *fengzheng*, as applied to a kite, came from the presence of an Aeolian bow called *fengzheng*.

Just as *fengzheng* can be found as a term for windbells, the word *fengqin* (again, "wind *qin*") can be found with the same application.[25] And further concerning the word *fengqin*, the second ideograph, "*qin*," can be, and often is, used as a generic term for a stringed instrument, finding its way into many — especially recently coined — musical-instrument names, including some for non-stringed, but multi-voiced, instruments. Such a

coining is the common modern use of *fengqin* as the Chinese name given to the Western pipe organ.

So, then, how does one, interested in embarking on flying a kite with an Aeolian bow, best speak of this aerial soundmaker in Chinese? Recently, in talking to a Chinese kite-seller in Chinatown, San Francisco, I found that *fengzhengde fengqin* — literally "a kite's wind-string-instrument" — was the term that got the concept across. And I discovered she didn't have such a thing, so I figured I'd need to make one myself. I have not yet done so, but I am looking forward to getting to work. One source of information on *fengqin*, and therefore one place to start, is the book *Fengzheng*, edited by the team of Wang Qinian, Wu Guanghui, and Yu Jiming. That this book is published by the People's Athletic Publishing Company of Beijing gives an indication of the popularity of kite flying as sport in China. A translation of the section on the *fengqin* accompanies the present article.

Kites with Aeolian bows have indeed long been a popular pastime in China. Around the turn of this century, Arthur C. Moule conducted extensive research on musical instruments and a great variety of sound-makers in China, publishing in 1908 the results of his research as *A List of the Musical and Other Sound-Producing Instruments of the Chinese*. Moule described Aeolian-bow kites he had seen in Hangchow (Hangzhou) and Shanghai, and related that there were "said to be many other varieties of kite bows and harps at Peking and Nanking, where kite flying is carried on every Spring with the utmost enthusiasm." The first of the Aeolian bows which Moule describes is the one he calls *fengzheng* (his romanization, *Fêng Chêng*), found in Hangzhou, consisting of a bamboo bow attached directly to the frame of a kite. Stretched across the bow is a narrow bamboo strip serving as a string. He points out that these Aeolian bows were also called *fengqin* (*Fêng Ch'in*). The *yaopian* (*Yao P'ien*; "kite piece," using a general term, *yao*, for birds of prey) of Shanghai was a bow made from "a very rough piece of bamboo" and strung with a ribbon of unspecified material.[26] It was used like a *fengzheng*/*fengqin*. The *yaoqin* (*Yao Ch'in*, "kite *qin*"), also of Shanghai, is a set of seven straight bamboo frames, each with its own tunable ribbon (again of unspecified material), mounted in a large bamboo frame which is attached to the kite string.[27]

Aeolian bows of the *fengqin* type are attached to the backs of "hard-winged" kites — kites with a rigid frame suited to windy northern China. These are distinguished from the "soft-winged" kites, with flexible wings, of southern China, where the wind is milder. Hard-winged kites are most popularly made in the shape of a swallow, and it is said that the flight of swallows was the inspiration for the present style of construction for this kind of kite.[28] Swallow kites may be either "thin" — long and slender — or "fat" — of proportionately shorter and deeper wings and tail.

In flight, the painted side of a kite faces down towards the person flying the kite; the unpainted side, the "back," is away from the flyer. This is the side on which the frame is exposed and which can carry an Aeolian bow (see Figure 2). This fact is reflected in an additional term for an Aeolian bow attached to a kite, a term which happens to be an unambiguous one, not to cause confusion with windbells or pipe organs. That term is *beiqin*, "[carried-on-the-]back *qin*."

NOTES

1. The Aeolian bow is part of the family of wind-activated chordophones which includes the Aeolian harp. Concerning the organology of this, note that an Aeolian "harp" is not a harp but a box zither, and that while an Aeolian bow is indeed a musical bow, some writers will also call it an Aeolian harp.

2. Joseph Needham, with the collaboration of Wang Ling, *Science and Civilization in China*, Volume 4, "Physics and Physical Technology," Section II, "Mechanical Engineering" (Cambridge: Cambridge University Press, 1965), 577, citing a theory of Lord Raglan, from his *How Came Civilization?* (London: Methuen, 1939).

3. In Japan, Aeolian bows on kites are called *unari*, "the thing which sounds *u*."

4. Perhaps the Southeast Asian Aeolian-bow kites best known in the West are those of Java. It has been speculated that Athanasius Kircher received the impetus towards his development of what was to become the Aeolian harp (which he described in his *Musurgia universalis*, 1650) from Jesuit reports from Java about Aeolian bows mounted on kites; see Thomas L. Hankins & Robert J. Silverman, "The Aeolian Harp and the Romantic Quest of Nature," Chapter 5 in their *Instruments and the Imagination* (Princeton, N.J.: Princeton University Press, 1995), 86-112, note 18 at 253. Aeolian-bow kites remain very popular in Indonesia. In Malaysia, kites are so commonly supplied with Aeolian bows that a kite without a bow would be the exception, not the rule; see Massimo Baistrocchi, "Kampong Pastimes" in *Arts of Asia* 14/6 (November-December 1984): 100-105, and Mubin Sheppard, *Taman Indera: Malay Decorative Arts and Pastimes* (Kuala Lumpur, et al: Oxford University Press, 1972), Chapter 13, "Kites and Kite Flying," 171-179. Cambodian Aeolian-bow kite-making is popular, and has come to the United States with refugees from that country; see Linda McKinney, "Singing Kites of Cambodia" in Jan Rindfleisch, ed., *Art of the Refugee Experience* (exhibition catalogue, Cupertino, California: Euphrat Gallery, 1988), 54-55.

5. The *muyuan* is sometimes cited as the invention of the 5th-century philosopher Mozi (Mo Di). As our subject is kites with musical sound-makers, which we will fly for our aesthetic enjoyment, it is ironic that this reputed inventor of the kite was a notoriously dour, utilitarian thinker, perhaps best known for his essay *Fei yue*, "Against music," in which he states reason after reason — ranging from excessive expense to lascivious excess — why music should not be practiced. "Against Music" is included in Burton Watson, trans., *Basic Writings of Mo Tzu* (New York: Columbia University Press, 1963), 110-116. Mozi's views were countered a century or so later by Xunzi in his essay *Yue lun*, "A Discussion of Music"; for this, see Burton Watson, trans., *Basic Writings of Hsün Tzu* (New York: Columbia University Press, 1963), 112-120. As Watson mentions in his introduction to the thinking and works of Mozi (and quoting a criticism from the book of *Zhuangzi*), a philosophy which allows "no singing in life, no mourning in death ... causes people to be anxious, to be sorrowful, and its ways are hard to follow." (Watson, *Mo Tzu*, 13). The term *muyuan* appears in the passage in the book of *Han Feizi* which describes Mozi's kite, although it does not appear in the analogous passage in the book of *Mozi* itself; see translation of the *Han Feizi* passage in Needham, with Wang Ling, *Science and Civilization* 4, II, 573. (For the body of this essay, the *Pinyin* system of romanization of Mandarin Chinese is used.)

6. For an illustration of such a kite, from the island of Yap in Micronesia, see Nora K. Chadwick, "The Kite: A Study in Polynesian Tradition" in *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 61 (1931), 455-491, at 457 (text-figure 1).

7. A Chinese general name for kites, hawks, and other similar birds of prey is *yao* (a name I assume may be considered roughly equivalent to the avian family name *Accipitridae*), which is also found in names for the Aeolian chordophones *yaopian* and *yaoqin*, from Shanghai, as described by A.C. Moule (see main text, this page).

8. Another instance of this dual naming is the similar correspondence in the Maori use of the word *kahu* for both the hawk and the flying device; see Chadwick, "The Kite," 476; the Maori-made kite (*he kahu*) illustrated in text-figure 4 (p.477) includes the representation of hawk-like claws.

9. Chadwick, "The Kite," 455.

10. W.B. Lockwood, *The Oxford Book of British Bird Names* (Oxford University Press, 1984), 91.

11. Roger Tory Peterson, Guy Mountfort & P.A.D. Hollom, *A Field Guide to the Birds of Britain and Europe* (Boston: Houghton Mifflin, 3rd edition, 1974), 71, plates 19 & 23; Rodolphe Meyer de Schauensee, *The Birds of China* (Washington, D.C.: Smithsonian Institution Press, 1984), 155-156; Cheng Tso-hsin, *A Complete Checklist of the Species and Subspecies of the Chinese*

Birds (Beijing: Science Press, 1994), 18.

12. Peterson et al, *A Field Guide*, 70-71, plates 19 & 23.

13. Wang Honxun, *Chinese Kites* (Beijing: Foreign Languages Press, 1989), 2-3.

14. Wang Qinian, Wu Guanghui & Yu Jiming, eds., *Fengzheng* ("Kites"; Beijing: People's Athletic Publishing Company, 1986), 73; Needham, with Wang Ling, *Science and Civilization* 4, II, 578.

15. It is also from the Tang dynasty that we find a number of poems of the subject of the *qin*, the classical seven-string zither, being sounded by the wind. The *qin* sounded by the wind and the *fengqin* ("wind *qin*") are two different things, the former being an existing string instrument which may be spontaneously sounded by the wind, and the latter being a musical bow to be intentionally sounded by the wind when aloft, attached to a kite. On *qin* sounded by wind, see my "The Wind Enters the Strings: Poetry and Poetics of Aeolian *Qin*" in *Experimental Musical Instruments* 10/3 (March 1995): 16-19, and "Zephyrs: Some Correspondences Between Bai Juyi's *Qin* and La Monte Young's *Composition 1960 #5*" in William Duckworth & Richard Fleming, eds., *Sound and Light: La Monte Young and Marian Zazeela* (Lewisburg: Bucknell University Press/London & Toronto: Associated University Presses, 1996 {*Bucknell Review* 40/1}): 132-151.

16. Gao Pian (d.887), *Fengzheng*, in Cao Yin, compiler, *Quan Tang shi* ("Complete Tang poetry"; Imperial preface dated 1707), *juan* (chapter) 598; facsimile reprint (Shanghai: Shanghai Guji Publishing Co., 1986), p.1521; also in Wang Qinian et al, *Fengzheng*, 72-73.

17. Guanxiu (832-912), *Fengqin*, in *Quan Tang shi*, *juan* 836 (reprint, p.2047), also found in a variant version in *Qinshu daquan* 20.27a, facsimile reprint in Music Research Institute of the Literature and Arts Research Academy, Ministry of Culture, and the Beijing *Qin* Research Society, compilers, *Qinqu jicheng* ("Collected *qin* pieces"), Volume 5 (Beijing: China Bookstore, 1980), 455.

18. Cao Zheng, "A discussion of the history of the *gu zheng*" (trans. Yohana Knobloch) in *Asian Music* 14/2 (1983): 1-16, at 2.

19. A reduplicative — called *diezi*, "repeated ideograph," in Chinese — is a verbal convention (or spontaneous creation) with a descriptive function which may often be echoic.

20. Liu Xi, *Shi ming* ("Explanation of names"), section 22; facsimile reprint (Changsha: Commercial Press, 1939), 106.

21. In, respectively, Ha Kuiming & Ha Yiqi, *Zhongguo Hashi fengzheng* ("Chinese kites of the Ha family"; Hong Kong: Commercial Press, 1986), 140, and Wang Qinian et al, *Fengzheng*, 74. That *zhengzheng* could be used for the sound of an Aeolian bow would be appropriate, but I have not encountered such a usage in a Chinese source. Approximate pronunciations for these echoic words are *zheng* — "jung"; *cheng* — "chung"; *weng* — "wung."

22. Wang Qinian et al, *Fengzheng*, 73.

23. From the *Yue shu* ("Book of music") section of Sima Qian's *Shi ji* ("Record of history"), cited in Zhang Yushu, Chen Tingjing & others, *Kangxi cidian* ("Dictionary of the Kangxi Emperor"; 1716; facsimile reprint, Beijing: China Bookstore, 1958), under *zheng* (8th section {*weiji*}, first part {*shang*}, 11).

24. Including, admittedly, my 1996 essay "Zephyrs," at 137.

25. For instance, in the sixth-century AD *Shui jing zhu* ("Commentary on the Classic of waterways") by Li Daoyuan (d.527), quoted in the *Kangxi* dictionary under *qin* (7th section {*wuji*}, first part {*shang*}, 12), as well as in poetry of Qiyi (Tang dynasty) and Wang Anshi (Song dynasty); for these, cf. *Fengqin* entry in Dong Yongshen, with Zhang Leshui & Dai Anlin, *Zhongguo yinyue cidian* ("Chinese music dictionary"; Taibei, Taiwan: Changchunshu Bookshop, 1985), 493.

26. Moule describes the *yaopian* as having "a sort of cylindrical bridge below the notch at either end of the bow," which may have made it similar to the Aeolian bow illustrated in Henry Balfour, "The *Goura*" in *The Journal of the Anthropological Institute of Great Britain and Ireland* 32 (1902): 156-176, at plate XII, figure 5.

27. Arthur C. Moule, "A List of the Musical and Other Sound-Producing Instruments of the Chinese" in *Journal of the North China Branch of the Royal Asiatic Society* 39 (1908): 1-160 & XIII plates (reprinted Buren, The Netherlands: Frits Knuf Publishers, 1989), "Class IV: Stringed Instruments, Section A: Air-vibrated," at 105-6. A *yaoqin* is shown in Moule's plate X, item 1.

28. Wang Honxun, *Chinese Kites*, 8.

(Translations from Chinese by the author.)

Mitchell Clark is a composer and a musicologist specializing in Chinese classical music. As evidenced by past articles in Experimental Musical Instruments *and elsewhere, he has a keen interest in Aeolian-sounded musical instruments, as well as their literature and lore. His primary concern in Chinese music is the seven-string* qin *zither, about which he often writes and upon which he occasionally performs. As a composer, one of his most recent performances is that by Margaret Leng Tan of his piece* The "Cobbling Hymn" Tune, *on toy piano, in Singapore.*

MAKING A *FENGQIN*

From Wang Qinian, Wu Guanghui & Yu Jiming, *Fengzheng* ("Kites"; Beijing: People's Athletic Publishing Company, 1986), 72-74; Translated by Mitchell Clark & Rene Yung

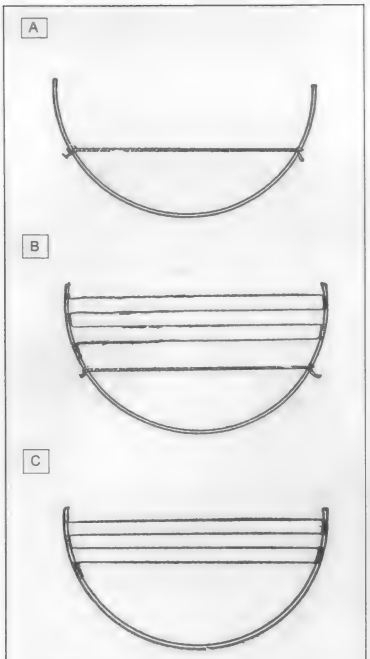
A *fengqin* is one kind of sound-making device which may be attached to a kite (*fengzheng*).[1] From the poem of Gao Pian,[2] we can tell that by the Tang dynasty China already had a device which, attached to a kite, could make a "*zheng*" sound (*zhengmingsheng*) in the wind.

It is no longer known what the nature of this device was in early times. Today, the chordophone attached to a kite is a musical bow which vibrates and makes the sound "*zheng*" (*zhengming*) when activated by the wind. The bow is made of bamboo or reed bent into a curved shape, with *qin* strings tightened upon it. Because of variations in the degrees of tension of the *qin* strings and of the force of the wind, the strings can produce a variety of sounds. This device is called "*qin*" or "*fengqin*"; attached to the back of a kite, it is called a "*beiqin*" ("[carried-on-the-]back *qin*"). In Beijing, one could still see kites with *beiqin* until the 1930s. Later, because the necessary type of *qin* string was not available, the pastime of using *beiqin* on kites disappeared.

Despite its name, this "*qin* string" is not a string from a musical instrument. It is made of silk, hand woven into a flat ribbon approximately one millimeter thick, very much like the decorative ribbon used on clothing. Therefore it is also called a "*qin* ribbon" (*qintiaozi*) as well as a "*qin* string" (*qinxian*).[3]

In 1981, members of the Kite Association of Japan visited Beijing and flew kites together with members of China's Beijing Kite Institute. The sound-making attachments on the Japanese kites were basically the same as the *fengqin* on Chinese kites, using bamboo made into a bow shape, except that the *qin* string was made of a very thin piece of rattan. They also sometimes utilize the plastic strapping bands used in packaging goods.[4]

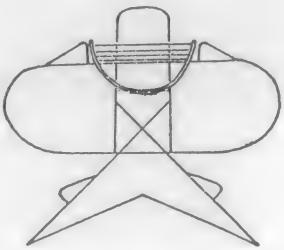
In its construction, the *fengqin* of China uses bamboo of about a finger's thickness,



MAKING A FENGQIN

Figure 1 (above): Three steps in making a *fengqin*: a) heavy twine is used to draw the bamboo into a bow shape; b) the courses of the *qin* ribbon are attached; c) the twine is removed. (From Wang Qinian et al, *Fengzheng*; Beijing, 1986)

Figure 2 (below): A *fengqin* attached to the back of a swallow kite. (From Wang Qinian et al, *Fengzheng*; Beijing, 1986)



which has the bamboo core (*zhuhuang*) shaved off, to make the bow.[5] Its design uses the *qin* ribbon to tighten the bamboo into a bow shape and, in turn, makes use of the resilience of the bow to tighten the *qin* ribbon. Therefore, one should not use fire to heat and bend the bow (as in other kite-making techniques).

The method of tying the *qin* is shown in Figure 1.First, use heavy twine to draw the bamboo into a bow shape (1a). Then use cotton thread (or twisted paper) to attach one end of the *qin* ribbon, vertically, to one arm of the bamboo bow. Then bring the *qin* ribbon horizontally and level over to the other side of the bamboo bow, and use the cotton thread to attach the *qin* ribbon vertically onto (the opposite arm of) the bamboo bow. Having done this, you will have tied on the first course of the *qin* ribbon. Continuing with the same method, you can add the second course, a third course, etc. of the *qin* ribbon (1b). When you've finished attaching the *qin* ribbon, you can then remove the heavy twine (1c). The tension of the bamboo bow is now relied upon to tighten the courses of *qin* strings. By moving the attached portions of the *qin* ribbon up and down along the bamboo bow, you can adjust the tension of the individual courses. The goal is to have a similar degree of tension among the courses. Lastly, apply thin (bone) glue to the upper and lower surfaces of the tightened strings. Wait for it to dry, and then, when you wave the bamboo bow in the air, the *qin* strings will make a humming sound (*wengweng*).

Generally, for use with a *fengqin*, a hard-winged swallow (*shayan*) kite of a wingspan of five feet or more is used, as it can withstand a greater force of wind.[6] A kite of a five-foot wingspan can hold on its back a *qin* of two courses, one of a six-foot wingspan can hold on its back a *qin* of three courses; a *qin* of four courses will require a swallow kite of an eight-foot wingspan.[7]

In the middle of the swallow, near the upper ends of the bamboo rods which form the frame for the tail, attach a length of bamboo, crosswise. Then firmly attach, with string, the bottom curve of the bamboo bow to this bamboo crosspiece. Next, attach one end each of two pieces of thin wire to the frame at the fore-edge of each wing. Place a tube cut from reed over each length of wire, and then attach the free ends of each piece of wire to the bamboo bow. The angle between the plane of the kite and that of the bamboo bow (now held in place by these reed-and-wire bracings) should be approximately 30° (see Figure 2).

As a fat swallow's wings are deeper (front to back), the curve of the bamboo bow used on a fat swallow should be a little deeper. And as a thin swallow's wings are shallower, the curve of the bamboo bow used on a thin swallow should be a little shallower.

NOTES

1. In *Fengzheng*, 74, there is also information on the *luogu*, a combined gong-and-drum kite attachment sure to make a delightful racket. (This and the following notes to the text by Mitchell Clark.)

2. Cf. Gao Pian's poem *Fengzheng*, included in "Aeolian-bow Kites in China," 42.

3. The two terms are used interchangeably in the original text.

4. Basically, any number of materials in a ribbon form have been used for this purpose. Henry Balfour, "The *Goura*" in *The Journal of the Anthropological Institute of Great Britain and Ireland* 32 (1902): 156-176, at 171-172, mentions the use of rawhide, woven tape, and whale baleen (Japan), split feather quills (India), and so on.

5. The three layers of the bamboo, described in Wang Qinian et al, *Fengzheng*, 25, are the outer "hide" (*zhupi*), the middle "green" layer (*zhuqing*), and the inner "yellow" layer (*zhuhuang*).

6. It appears that a traditional Chinese foot (*che*), which is equal to 35.8 centimeters, is meant. (In general, the book *Fengzheng* uses the metric system.)

7. From this it appears that the ribbon used for strings on a *fengqin* offers a certain amount of resistence to the wind, with a larger number of strings requiring a larger, and therefore more powerful, kite.

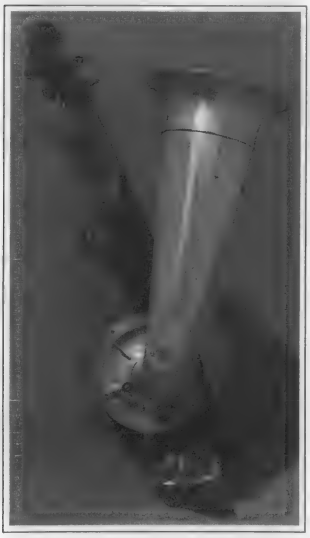
THE HOMEMADE CLEMENTS PLYWOOD CENTENNIAL AUGUSTUS STROH VIOLIN

By Cary Clements

My desire to make a Stroh violin began about five years ago, when a co-worker at the electric violin factory where I worked showed me a drawing of one in a book. What I saw was a four-string violin with a skinny body . . . and a horn! I sought as much information as I could find about this most obscure and fascinating of musical instruments. I got so tied up in its history, and the story of its inventor, Augustus Stroh, that the searching turned into research, and before long I had written an article entitled "Augustus Stroh and the Famous Stroh Violin" that appeared in *EMI* (Volume 10 #4, June 1995).

Prior to the mid-1920s, recording studios used wax as a recording medium. Instead of a microphone, a large horn was used to gather the sound. At the end of the horn was a sensitive diaphragm with a sharp needle in the center. As musicians played into the recording horn, the vibrating needle cut a continuous groove into a rotating cylinder coated with wax. This kind of recording is known as acoustic recording.

Cary Clements plays his Stroh violin. The bow-tie shaped device screwed to the body behind the diaphragm housing allows the use of a shoulder rest. This makes playing the instrument more comfortable.



Rear view of an honest-to-goodness Stroh violin. The two halves of the horn are stamped out of aluminum and joined with a folded seam. The bell at the open end of the horn is probably spun. The diaphragm housing on the original Stroh violin is made of cast aluminum.

Due to the limitations of wax as a medium, the best acoustic recordings were made when the source being recorded was LOUD. Singers that could sing in a very powerful voice were the ones most often recorded. Acoustic recordings also were very low fidelity; in other words not a very broad range of frequencies was recorded. None the less, many beautiful recordings were made during this period, and many collectors today are only interested in discs and cylinders that were acoustically recorded.

One of the quirks of acoustically recording an ensemble of musicians that included violins was that it was usually hard to hear the violins in the resulting recording. This situation was remedied by the introduction of the Stroh violin in 1901. The Stroh violin was designed to be very loud in the mid-range frequencies that recorded well in wax. It was also designed to be highly directional in its output. The player could now point the horn of the violin, and focus the sound into the recording horn. As a testament to the success of Augustus Stroh's design, the Stroh violin was a state-of-the-art recording tool for more than twenty years.

When acoustic recording was replaced by electrical recording in the mid-1920s, the Stroh violin lost its usefulness to the recording world. However, the Stroh related instruments, such as horned versions of guitar, mandolin and bass, as well as the one-string phonofiddle, had caught on with musicians playing in the days before PAs and electric musical instruments became commonplace. The Stroh violin was manufactured in London and ceased to be made in 1942.

The main features of a Stroh violin are a rocking bridge platform, a spun aluminum diaphragm, and an arm attaching the two. When the string is bowed, the vibration of the

Figure 1

Figure 2

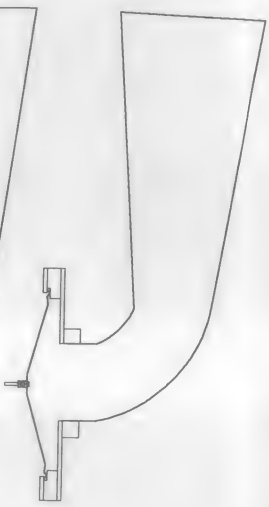


Figure 1: Cross sectional view of the diaphragm housing and the smaller horn from the Clements Stroh violin prototype.

Figure 2. Cross sectional view of the diaphragm housing and the larger horn from the Clements Stroh violin prototype.

Figure 3. Cross sectional view of the original Stroh violin diaphragm, connecting rod, and part of the connecting arm. Note the three ridges in the outer perimeter of the diaphragm. These make the center portion of the diaphragm much less rigid than the single-ridged National Tricone replacement cone used in the Clements Stroh violin prototype.

Figure 4. Cross sectional view of the National Tricone diaphragm, part of the connecting arm, and the screw and nuts that hold the two together. This is the set up used on the Clements Stroh violin prototype.

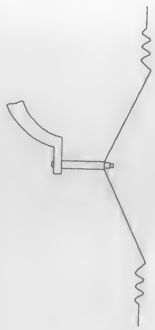


Figure 3

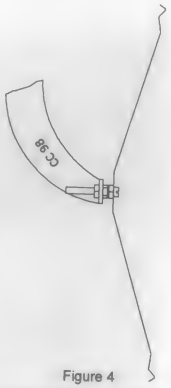


Figure 4

string causes the rocking bridge to move in a corresponding side-to-side vibration, which is transmitted by the arm to the aluminum diaphragm. The diaphragm is situated at the base of the megaphone-style horn, covering the opening of the horn's narrow end. The movement of the diaphragm excites the air in the horn, and the horn in turn directs the sound out into the world.

As I began to think about making an instrument of this type for myself, I saw two major hurdles: 1) finding or making a suitable vibrating diaphragm and, 2) finding or making a suitable amplifying horn. The first of these problems I solved rather quickly. I knew that smaller-size spun aluminum cone/diaphragms intended as replacement parts for the National Tricone resonator guitar were easily available.* So, three years ago I bought one from Gene Rhinehart of Vancouver, Washington who spins replacement cones for resonator guitars.

The diaphragm in the original Stroh violin is five inches in diameter and the cones for the National Tricone guitar are six inches in diameter. This was close enough. Thus, the first step in the construction of my Stroh violin was complete.

Using CAD (computer-aided drafting) on a Macintosh computer, I carefully measured and drew a cross-sectional view of the diaphragm. I then made another drawing of the circular housing I was going to make for the diaphragm. And that's all I got done on the violin for three years. Life interrupted, as they say. But I didn't forget about it.

Augustus Stroh applied for a patent in the United Kingdom on May 4th, 1899 to protect his violin design. The fact that he was doing the design and development of what was to become known as the Stroh violin exactly 100 years ago occurred to me as I was finishing up my violin and preparing to write this article.

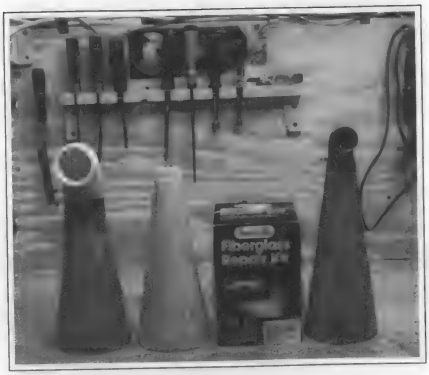
Since I began my research about five years ago, I've only actually seen and touched one 4-string Stroh violin. I've had some close encounters over the years, but the Stroh is an elusive breed. I knew that at this point in time making an exact replica would be a little out of my range, and besides, I had too many questions about the "inner workings" of the Stroh violin to attempt that. The instrument that I am going to describe in this article is not an exact replica but is a working model of the Stroh violin. In other words all the parts and mechanisms are basically there, they just don't look exactly the same as the original.

Six months ago I finally got busy and seriously began to construct what I sometimes call the Centennial Stroh, the plywood Stroh, or the Clements Stroh. By then I had moved from San Francisco to Maine to work in a guitar factory. I often start projects that end up taking more than a few years to complete, and this violin is one of those. I dug through all my boxes, found the parts I already had, and set to work.

The first thing I did was to make the housing for the diaphragm. I marked out with a compass a circle of 7¼" in diameter on a piece of half-inch thick plywood. I'm using the high quality voidless plywood here, sometimes known as Baltic birch. This stuff was marked "Made in Russia". We use it in the guitar shop for making guitar molds and other fixtures. It happens to be very

*The National Tricone guitar was invented by John Dopyera, and patented by him in 1927. In his design three spun aluminum cones are seated in the body of the instrument. The strings pass over a bridge that sits on a T-shaped bar that connects to the center of each cone. Each cone is only six inches in diameter enabling them to fit inside the profile of a guitar belly.

Above and below: The Cenntennial Stroh violin, front and rear views.

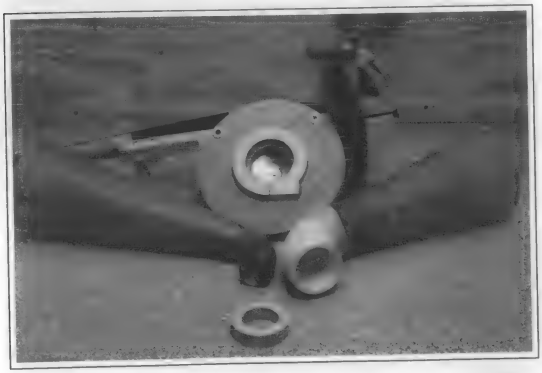


Above: The two horns, and the wooden mold and fiberglass kit used to make them.

Below: The horn on the left was the first one I made. The brass elbow is 1½" in diameter. The horn on the right has a pvc elbow that is 2" in diameter. The split clamp on the back of the housing holds the larger horn in place. The split ring in the foreground allows the smaller horn to be used also. The shoulder rest can be seen in place on the violin.

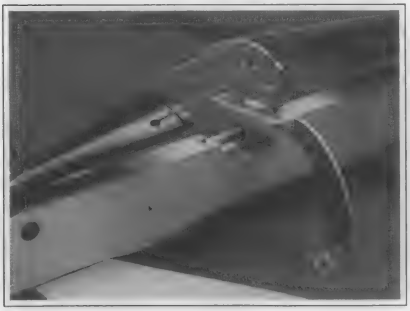
Above: The diaphragm, housing, and large horn assembly.

Below: The bridge platform and connecting arm assembly (top), the axle pin, and the violin bridge.



With the diaphragm housing removed and the strings remaining tuned to full pitch, the bridge, platform, and connecting arm can be moved in one direction ...

.... then the other ...



.... and then come to rest in their original position.

Right: Close up view of the bridge, connecting arm, diaphragm, and housing of a real Stroh violin. A brass knife edge attached to the connector arm rides in a groove in the curved plate on the mahogany body of the Stroh violin.

dimensionally stable. One of the beautiful things about making this violin is that it was made from scrap pieces.

Using a fly cutter on the drill press, I cut a 6" diameter trough from the same center just deep enough for the edge of the diaphragm to protrude from. I had squared off the end of the cutting bit so that the bottom of the trough would be flat. I then cut a slightly smaller concentric hole all the way through the piece. Using the bandsaw I cut to the original 7¼" penciled circle, and then cleaned up the outer edge on the disc sander. The piece I had at this point was donut-shaped with a rabbetted ledge on the inside diameter.

Using .020" thick neoprene rubber, I made a seal to go underneath the diaphragm in the housing. I cut the rubber accurately by fastening the rubber to a backing board using double-sided tape, and using a circle cutter. The circle cutter was quickly made by accurately drilling three small holes in a piece of plexiglas. A push pin was used to hold the plexiglas in place in the center, and a sharp x-acto knife used in the other holes to cut the two diameters.

Using 1/8" thick plywood I made a retaining ring that rides on the very outer perimeter of the diaphragm and is screwed to the housing. This holds the diaphragm firmly in place in the housing. Later on, after I had assembled the whole violin, I inserted a thin cardboard shim underneath the rubber seal to slightly increase the pressure tension on the rim of the diaphragm from the retaining ring. The shim is the same size as the seal (6"OD, 5.5"ID) and was made from a cereal box. I simply drew the circles with a compass and cut it out carefully with a pair of scissors. After inserting the shim, the diaphragm became much more lively when lightly tapped with a finger.

The body of the violin started out as a stick of scrap plywood an inch and a half wide by two feet. I cut a 45° bevel on the bottom edge of this piece about ten inches long. I attached the housing to this bevel on the bottom of the stick by using two drywall screws and a couple of washers.

For the bridge platform I used plywood, and a 3/16" precision drill bushing. This type of bushing is normally used as a guide for drill bits in a production fixture. As an axle for the platform that would allow the platform to move laterally, I used a .189" precision measuring pin. It fit into the drill bushing hole with very little clearance, and allowed the platform to move very smoothly. I then cut some notches in the body to hold the pin and bridge platform in place. The center of the platform where the bridge sits now lines up with the center of the diaphragm.

Holding the platform level, I sketched out a connector arm that I cut out of aluminum. This arm was then screwed to the platform and the opposite end of it was bent at a right angle so that it fell over the center of the diaphragm. A hole was drilled in the right angled part of the arm and a small screw used to attach it to the center of the diaphragm.

Now I had a long stick with a swinging bridge platform, the arm of which is attached to the aluminum diaphragm. My original plan was to make the neck separately, and bolt it to the body. Then I discovered that the stick had just enough room for a tailpiece, and if I

laminated more plywood to the sides, would also be wide enough, and long enough for the neck including the headstock.

My fingerboard is ebony. This was originally intended for a production electric violin, but had a large cosmetic blemish right where the playing surface would be. I had been carrying this piece of wood around with me for about five years. I decided to use it instead of the scrap of micarta that I had originally thought I would use for the fingerboard. After carefully laying out the neck I glued on the fingerboard.

For tuners, rather than violin pegs, I bought the cheapest set of mandolin tuners I could find. The ones I chose are the Ping brand. Before using them I had to shorten the string posts, since they were too long to use on the smaller violin headstock. I also had to drill new string holes in the posts. I drilled the holes for the tuners in the headstock so that the strings would have a straight pull. I did this for no other reason than it looks good. The whole task of laying out the neck, including getting the proper neck angle was made so much easier because of using CAD on my computer. For anyone interested in building musical instruments that require any degree of precision, I can't recommend enough learning to use a computer-aided drafting program.

Probably the biggest challenge for this project was the making of the horn. The original Stroh violin used an aluminum horn that was stamped in halves, and held together with a folded seam. Other horned fiddles used a spun aluminum horn. My Centennial Stroh violin uses a fiberglass horn.

I spent many months searching hardware stores here in Maine for the right elbow to use for the horn. I finally found a brass plumbing fixture 1½" in diameter that had a 90° bend. I glued up some scrap wood into a large block, and a friend used this to turn a mold for the horn on a wood lathe.

With the brass elbow set on this mold I glassed over the whole thing. I had wrapped the wooden mold with clear packing tape hoping this would make the finished horn pop right off of the mold. I discovered soon after the fiberglass had set that resin does stick to tape. Since I couldn't get the horn off of the mold, I took some drastic measures. With the bandsaw, I made two lengthwise cuts through the wooden mold and the fiberglass on it. Using a spatula I was able to pry the horn and elbow off of the mold without inflicting any major damage to the horn. I fiberglassed over the cuts in the horn to complete that task.

The horn is straight sided, and about 10 inches long. The wide opening of the horn is 4 inches, and it tapers to 1½" where it enters the elbow. To the bottom of the diaphragm housing I screwed a round cover that has a 1½" hole in the center of it. Around this hole I screwed a split flange made of plywood. A screw on the flange is tightened and this holds the horn firmly on the housing.

I played the violin for a few weeks with the original horn, and then decided that the brass elbow that I used was too small for the job. It looked as if it were choking some of the sound of the violin, so I remade a new horn using a pvc elbow with a diameter of two inches. Since the new horn is larger I had to remake the split flange clamp that holds the horn in place. Once this was done I made a split ring that enables me to use both horns and compare the sound of the two.

Part of the challenge when building a musical instrument of any sort is to find the sound you are looking for. To do this, it is important to know what can be varied in the construction, and how this will affect the sound. What I was looking for in the sound of my Stroh violin can be expressed very simply. I wanted it to sound like a violin, and I wanted it to sound somewhat pleasing to the ear.

When I first strung up my instrument it had a harsh sound, and was not very loud. Stroh violins are legendary for their loudness. They were designed to be played with other loud instruments, and still be able to cut through and be heard. Part of the lack of volume in the Clements Stroh can be attributed to the shape and stiffness of the diaphragm.

If you look closely at the diaphragm of the original Stroh violin, you'll notice three ridges in the outer perimeter. These have the effect of making the center of the diaphragm looser, and freer to vibrate. The trade off is that the diaphragm is not as strong and rigid as one with less ridges. But this doesn't matter because there is very little downward, or upward, pressure on the center of the diaphragm on a Stroh violin.

To prove this, I removed the diaphragm and housing from the instrument without detuning the strings. The strings stay in tune, and the bridge doesn't lean to either side; it stays centered. The connecting arm simply transfers vibration from the bridge to the diaphragm without adding significant pressure to its center.

The diaphragm on my Stroh violin, from a National Tricone guitar, was designed to take direct bridge pressure on its center, and therefore is very stiff. It also only has one ridge in its outer perimeter. On the guitar, the strings are mainly plucked, which introduces a lot of energy at once which then slowly decays. This cone is perfect for taking a lot of pressure on its center, and the burst of string vibration that a pluck is.

But don't get me wrong, it made a good-sounding Stroh violin. It's just that when I do it over again, I will be looking for a diaphragm not quite as stiff, even if it means learning how to spin metal and making it myself.

The other problem with the sound that I mentioned, the harshness, actually improved quite a bit with the larger horn. The sound was a little mellower, a little bit louder, and a lot easier to listen to. I suspect it has to do with the lower resonant frequencies of the larger horn amplifying the higher frequencies a little less, and the lower frequencies a little more.

Another thing that I don't like about my Stroh violin is the connecting arm from the bridge platform to the diaphragm. I think a lot of vibration is damped due to the arm being so long and flimsy. The aluminum that I used is .060". I have thought about repositioning the housing and making a shorter and stouter arm but I just haven't done it yet.

Overall, I am very pleased with how this instrument turned out. I learned quite a bit while making it. I put very little energy into how the violin looks, and yet it still turned out looking pretty cool. And it only took five years to make.

Cary Clements left California in 1997 to work in an acoustic guitar factory in Maine. Before that he repaired guitars, made a few electric violins, and was a part-time harpsichord mover in San Francisco. He is always interested in new information about the Stroh violin, especially if someone has an original one to sell or loan him so that he can study and draw a real one in more detail! He can be reached at 4 Curtis Street - 2nd floor, Lewiston, ME 04240; telephone-207-777-5201;
email Cary_Clements@onf.com

This is the second in a series of three articles from Monte Thrasher on future directions for sound art.

DEEPER INTO FLESHTONE
Sound Energy within the Human Body

By Monte Thrasher

In my earlier article, appearing in the September 1998 issue of *EMI* (Vol. 14 #1), I wrote about the unique physical properties of infrasound and the weird, disturbing, almost sorcerous effects it has upon the emotions.

How can mere quivers in the air — and inaudible quivers, at that — stir up brooding panic and an uncanny sense of holy dread? I believe the answer lies in the way infrasound naturally kicks around inside our bodies. When we walk or run our feet smack into the ground — a smack of hundreds of pounds of force — an equal and opposite reaction kicks up from the ground and into the body where it echoes about in a rhythmic, sloshing way. This sloshing helps to time and prime the swing and sway of the limbs, coordinating their rhythms and nudging them along as they go. A mass set in motion — like a flywheel — is a great way to store and release kinetic energy to further propulsion, but animal bodies use slosh and sway rather than spinning.

We can sense this internal activity only obliquely. Our ears are naturally deaf to infrasound — a good thing, too, since infrawaves are big beasts and would immediately stomp into ruin any apparatus sensitive to the feather-delicate audible-range waves. Only our motion senses, the inner ear and proprioception, know of infrasound. The inner ear responds to a blast of infrasound (or its abrupt cut-off) with vertigo and disorientation. Proprioception — the sense of limb position and motion — is so deeply rooted that it reports almost exclusively to the unconscious. Proprioception seems to be the first sense to have evolved, and it's our first sense, individually, for it's the first to develop in the womb, and so proprioceptive infrasound experiences touch upon something deeply primal, instinctive, and spontaneous.

My partner Chester Oswalt and I hope to be the first *inframusicians*, exploring the complexities of the human heart with rich and subtle outpourings from our unique infrasound speaker. We call it the Godbox. I described it in the first part of this article, appearing in EMI's September 1998 issue (Volume 14 #1).

So many explorations to be made! Here are some fundamental unanswered questions in inframusic:

• If an audible-range tape recording is played so slowly that it drops down into the 10 Hz-to-20 Hz range of the Godbox (the 'dark octave'), will the harmonies still feel more pleasant than the dissonances? Our crude equipment has only allowed us to explore one frequency at a time. Individual frequencies *certainly* evoke distinct gut-emotions. One makes you slightly dizzy-drunk, one — our 'demonic' frequency — is queerly unpleasant, and one makes you blush and your nipples stand out (I'll sketch the sexual aspects of infrasound in a moment). [Digital sound equipment might help us study this (it's certainly the easiest to obtain) but it's not built for infrasound, and I fear the bit-grain of digital sound will tamper with the smooth-and-slowly-unfurling nature of the long infrawaves.] This simple, crucial experiment in infraharmony waits to be done, held back by a ripped rubber seal in our Godbox and our own lack of audio equipment.*

• Do different *waveforms* — sine, square, triangle, etc. — feel different in infrasound? Will synthetic infrawaves feel different from organic? Our Godbox is a proper speaker, capable of playing complex waves, not just a beepmaker, so we can play real-world infrasound, like the calls of elephants and whales.

• Will these animal infracalls feel *alive*? If so, they should be more impressive, more massive and muscular than, say a lion's roar. Elephants have at least 30 calls — of desire, of anger, etc., and different individuals have distinct voices. (The San Diego Zoo has promised us tapes.) Can humans distinguish one call or voice from another? Can we know what they're feeling from their infratone of voice? Do elephants sing? Can we take pleasure in that song?

• The overarching question is: *how acute and passionate is the human infrasound sense?* Certainly our Godbox experiences made us more sensitive. I think infrasound is more than a gimic, more than a novelty: we literally have a new range of expression here.

I've two special projects to try:

A Shepherd's Tone: This is an intriguing aural illusion, a gliding tone that rises rises rises endlessly (or falls falls falls, if you play the tape backward). It's based on the ear's difficulty in distinguishing a tone from its octave duplicates. Fade in, say, low C, glide up to high C, and fade out that tone as you fade in the low C. Do that over and over. A sound analog of a spinning barber pole.* Now, if we can build a Shepherd's Tone in the dark octave — says my intuition — we'll get a Lovecraftian sense of space itself caving in around us. Yay! (Chester, ever the Guerilla Artist,

*If you've ever wanted to be a part of a pioneering art form (why else would you read *EMI*?) the Godbox Project needs you! We need builders, electrical and electronics people and lively minds of all kinds. We need doers, not dreamers, although everyone's welcome. Call and don't be shy: (818) 846-5467 or (818) 972-9822. Most of all we need a speaker tech to fix that seal!

is eager to try this — on the unsuspecting. I, a gentle utopian, try to rein in his anarchic impulses.)

Years ago I heard an endlessly cycling fugue on the radio, an ad for *OMNI* magazine. I *seem* to remember a flexi-disc of it in the mag, but I can't find it. Can anyone lead me to it?

Bodily Entrainment: Imagine shelves of identical violins, identically tuned. Pick up one and bow the strings — all at once, as if by magic, all those untouched violins sing! That's entrainment, also called sympathetic vibration, and it says a lot about what makes tuning enchantingly special. Tuning an instrument properly does more than make it sing specific tones; it *sets the mechanism on a hair trigger*. It would *have* to, for the untouched violins to sing, for the physical force of sound energy is astronomically feeble, pressures of a few billionths of an atmosphere.

Can human bodies be entrained? I imagine a rock show — featuring my dream experimental instruments of course — with a lively go-go dancer happily cooking to the beat. The dancer is not just to look at though: for on (or in) her body is a kind of microphone (the Auditac, see below) which picks up her fleshtone, amps it, and plays it to the audience through our Godbox.

If *that's* not the most dancible music ever, I'll eat those violins.

I'd have several types of bodies a-dancing (to entrain everyone in the audience) and blend into one rich resonance their individual fleshtones by putting them all upon one slightly bouncy wooden box stage.

I'm not alone in my ambitions for fleshtones. I've dug up several fascinating patents that use it.

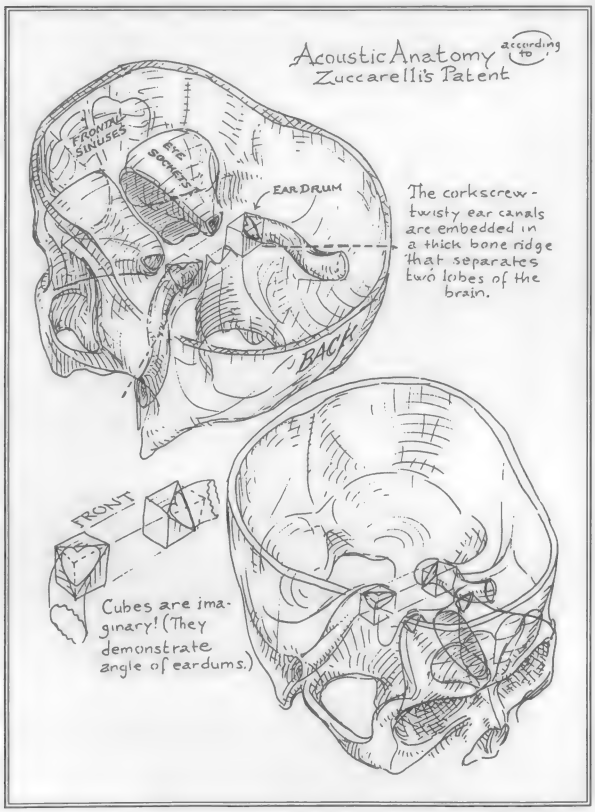
The Bonefone was an ingenious personal music device that was torpedoed commercially by the Walkman. Two cigarette-pack-sized electronics modules at the ends of a long pillowy blue bar of fabric and foam. You draped this over the shoulders so the modules would lay on the chest. Inside these were speakers sealed in big aspirin-tablet-shaped capsules, plus some transistor radio bits. The radio would play its vibrations right into your flesh and spread via bone conduction up the neck to the ears *from the inside*. It worked great, as I remember; I only got to play with it once. No one could hear it but you, unless you cranked the volume up full, and then they could hear it *issuing from your ear canals*.

I remember trying to sing along with one Creedence Clearwater Revival song and I was struck by the fact that, unless I sang exactly on key, and even tried to imitate the timbre of John Fogerty's swampdog voice, the mismatch of voices was physically uncomfortable. What a boon to singers such a device would be! In fact, a device to teach the deaf to speak, using audible fleshtone (played through a speaker at the larynx) has been patented.

You've heard audible fleshtone before; you hear it every time you speak, for sound travels more forcefully from your voicebox to your ears within your flesh than outside it through the air. With crisper detail, too, since flesh is so much firmer and denser than air. This is why a tape recording of your voice sounds so lame and alien; its recorded through air, that shapeless, insubstantial substance.

How sound sounds *to you*, in your own head, as opposed to how it sounds to an air microphone, is at the core of a most remarkable invention, the Holophonic Recording device (Hugo Zaccarelli, U.S. Pat #4,680,856, July 21, 1997).

It looks like a severed human head! It *is* a human head — well, a human skull, anyway, including its teeth. The skull is covered with several different kinds of lifelike rubber to imitate the vibrational signatures of muscle, skin, cartilage, etc. It has a tongue, nose, all the sinuses, a brain-like bag of goo in its cranium and a human-hair wig. It has rubber ears (cast from those of the skull's original owner, a British boxer named Ringo), realistically shaped ear canals (see my drawing, from the patent's description) terminating at specially angled heart-shaped membranes, just like the real eardrums.



*I hear that some modern-day carny tours the UFO conventions with a silver spray-painted circular plywood platform, upon which (for a fee) people can stand to bask in the mysterious energy which levitates the starships. What they get is a Shepherd's Tone, played from a hidden speaker.

Although the inventor laboriously avoids the word *microphones* (hmm...why does he do that?) microphones there be, attached to the eardrums. All this is heated to body temperature. Then Ringo is placed in aurally interesting situations and plugged into a tape recorder. Is all that effort worth it?

Goddamn right it is! Holophonic recording is fantastic! Sound Sculptors should leap up and take notice, for this breakthrough in 3D sound recording makes what we love about sound in space available to a mass audience for the first time. Holophonics has the potential to transform Sound Sculpture from the peculiar hobby of scattered individuals into a solid artistic movement. The world needs us, folks. Music at large is pathetically inbred and producing sad grotesques. We can change that, and should.

Key to Holophonic's success is its ability to distinguish sounds from in front from sounds from behind. The trick is that our heads are 'translucent ' to sound, and built differently in front than in back. In front are these complicated wafter-thin air pockets, the sinuses. In back is a thatch of fiberous stuff called hair (extraordinary material, hair: nearly indestructable, except by fire). Sounds from the front penetrate the sinuses and acquire a pinched, reedy timbre, whereas sounds from behind pass through the thatch and sound muffled. It's this timbral change, read instantly by the instincts, that tells us (in part) where a sound is from. Left and right sounds, of course, are read as such by our two ears, though it's not as simple as that.

All heads and bodies are asymmetrical, especially inside, so each side has its own similar-but-distinct fleshtone echo. The septum, that rudder-shaped wall that cuts through the nasal cavity, is never down the centerline of the head. (I can't help wonder if our eyeballs and sockets affect sound as well, since our cone-shaped sockets point right at the inner ears, and I've seen spherical sound lenses at the Exploratorium. (The eyeballs resonate at about 18Hz, one disorienting Godbox frequency.) I know owls hear through their eyes: their ear canals open onto their great conical eyesockets, which scoop up sound. Owls hunt by their acute hearing, aided by the extreme asymmetry of their eyesocket/soundscoops; on one side the delicate scrolls and folds of bone tissue are perfectly formed, the other side looks half-melted. There is no mention of eyeballs or sockets in the Holophonics patent.)

The Holophonics demonstration record, *Aldebaran*, is best heard through headphones, but a mono speaker — even a fairly crummy one — is almost as good. My favorite bit is the paper bag dropped over the head — my head, *your* head, it's very much a personalizing effect, like a hand-held point-of-view camera in a movie. Call it a p.o.a., point of audition. At one point, a woman leans over your shoulder from behind and says hello? Hello? The accuity is so fine that I swear I can feel her approaching, silently, before she speaks — a delicious, creepy effect, like a spirit hovering near in a séance. This is her sound shadow, the quiet pocket in space where the body soaks up ambient sound energy. I'm amazed that *any* device could pick this up.*

(I once proposed, facetiously, a record album of roomtone, the barely-there but distinctive ambient hum of a still room. At the end of a shoot, movie sound recordists may ask the crew to stay still and quiet while they record a few minutes of roomtone. It's barely there, but you'd notice something wrong if it weren't there, so post-production sound dubbing typically includes a background of roomtone mixed in. Careless lack of proper roomtone is part of what makes cheap movie sound sound cheap. Well, with Holophonics, one could actually make my Conceptual Art album idea worth listening to: a lofty, empty cathedral would actually feel (*hear*'s the wrong word) different from a humid sewer).

One *Alebaran* track is a thunderstorm, at night, in a desert valley, in a big wooden house — nothing on the tape gives that locale, but it's clearly that. The wooden rooms shudder and sway at the drenching crashes of sound, we hear them echo down a connecting corridor. All the sonic detail is overlapping, translucent, ghostly, like an x-ray image. But Holophonics isn't so perfect that sound looses its mysterious, incorporeal quality. Listening to the sound is as much an exploration of one's own dimensionless mental space (as with any good, polyphonic music) as it is a declaration of real, physical space.

As a demonstration record, *Aldebaran* is an array of familiar sounds inflected in a new way. I can't wait to hear new, wild sculpted sounds recorded this way.

There is music on *Aldebaran*, but it's one of the least satisfying tracks, somehow. It's a little hard to float away on the music when the whole band is sitting on your lap (so to speak). The band fades out by walking far, far away, and this transit is more interesting than the tune, nice though it is. Holophonics just *begs* for what we *EMI* readers can provide.

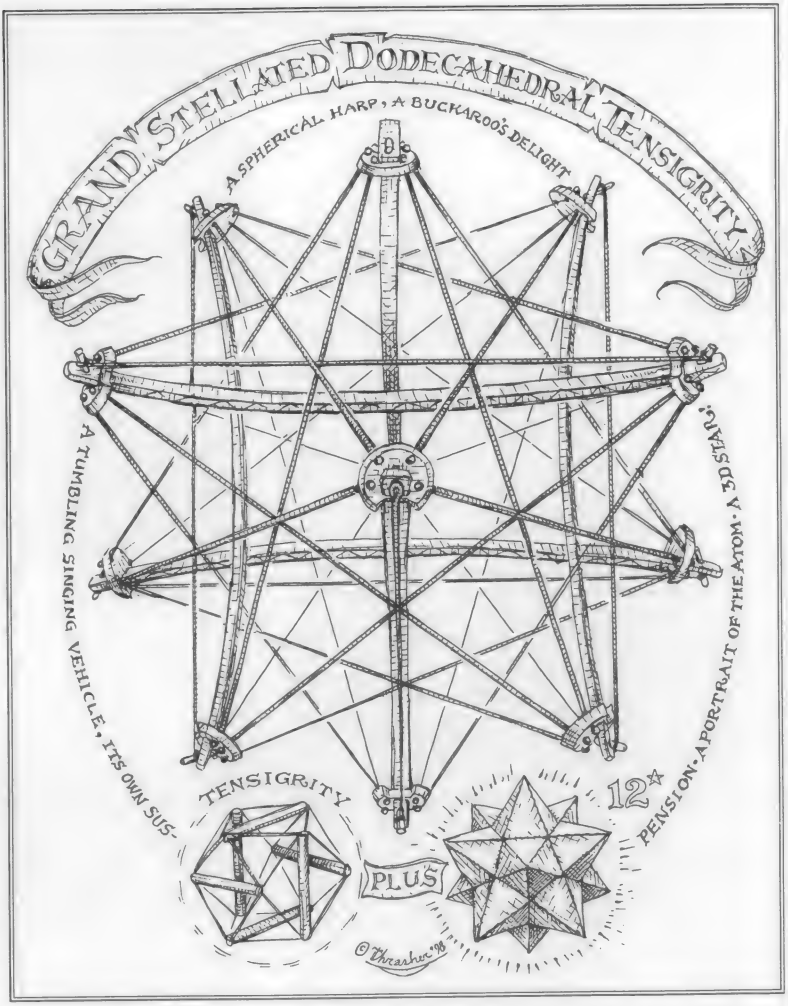
My own dream Holophonic recording involves sirens.** Some years ago Chester and I built a set of eight tunable sirens, quite crude constructions but they worked just fine. We were delighted with the fierce and urgent harmonies and astringent dissonances they made, but what I loved about them was the shimmering swarming interference patterns they created when set up at different positions around a rooom. You see, sirens spit out very distinct beams of sound, and the cris-crossings of these beams in space made crisply defined zones of boosted or diminished volume. We found that this was clearest when all the sirens were tuned to a common tone. Wading through this gloriously charged space was like living in a 3D noise pattern, a prisming trick, a hologram. (I'd like to make a giant mobile of sirens to slowly swirl above and around a seated audience. The torque of their motors would propel them through space much faster than regular mobiles (which are driven by feeble stray air currents). This torque-induced motion is an inobvious means of propulsion (it's a consequence of the siren motors' rotors pushing against their stators, which, being mobile, *in* a mobile, are free to be pushed around), so the whole dangling, whirring formation would seem to be cranked through space by some unseen hand.)

I'm currently at work on a sophisticated polyphonic siren. I'm amazed that so few people have explored this wonderful means of making musical tones. One of their many advantages is that the basic principle (chopping a steady airstream into timed puffs to make a tone, for sound is just fluctuating air pressure) is so

*From the editor: A peculiar facet of this holophonic recording technique might be worth noting here. When the recording is made in conjunction with the mock-human head and then played back, the playback enters the listener's ears once again through the same course of channels and obstacles (this time in the listener's own head and ear structures), thus reduplicating all the effects that the holophonic recording has already captured. This reality-squared effect may help account for the hyper-real quality (seemingly more realistic than reality) that the author describes in the audible result.

** For a full description of sirens, their mechanisms, and their musical potential, see "Sirens, Part 1" in *EMI* Volume 12 #4 (June 1997).

efficient that no microphones amps, or speakers are needed to flood a large performance space with sound. Little air pressure is needed; in fact a household vacuum is overkill. (My Pneumatic Martian Warrior Robot — as yet unbuilt, but a drawing of which appeared in *EMI*'s June 1998 issue — wears a backpack of two old-fashioned chrome cylindrical vacuums which provide air (and noise!) for his vocal apparatus, a blower-siren-plus-sucker-siren for maximum loudness. His inflatable beach-ball-vinyl body acts as resonator, and when he screams it's horrendously LOUD, a startling contrast to his jellyfish-fragile balloon body, which being flexible and precariously balanced, shakes and shudders with terror and rage. I hope you enjoyed my *EMI* 'centerfold,' it has the kind of acoustic-mechanical anatomy I thought you'd all drool over.)



My grand scheme is to build a big balloon/resonator/performance environment in the shape of a stellated dodecahedron (see sketch). This beautiful object, a star-in-the-round, looks quite exotic but is easy to construct; just inflate an ordinary square plastic bag and you'll get just the right proportioned cone at the bag's corners — a 180° cone. Twelve of these cones, cut and taped together properly, will make a lovely 12★(as I call it for short). I'll put a polyphonic siren in each cone/corner, pointed at the 12★'s core, where they'll sonically irradiate our audience (3 or 4 people) from 12 points in space with their powerful harmonious beams. Intuition tells me the 12★'s lush geometry will lend a glorious sonority to their resonance. I'll make my balloon of silver mylar so the interior will be a seemingly infinite mirrormaze/3D kaleidoscope. I hope to have this built in time to conquer next year's Burning Man festival. Join me!

I once wrote to Hugo Zuccarelli (holder of the holophonic recording technique patent) about potential for Sound Sculpture, but I never received a reply. I wanted to rent or borrow Ringo (although I'm told he's expensive) and when he began to look unobtainable I made steps to constructing a Head of my own. Chester's a bone expert — he once worked at the La Brea Tar Pits, identifying the bony bits they dug up — and he could acquire skulls for me. But as I began the work I got snagged on the 'microphone' mystery — why did Zuccarelli avoid the word?

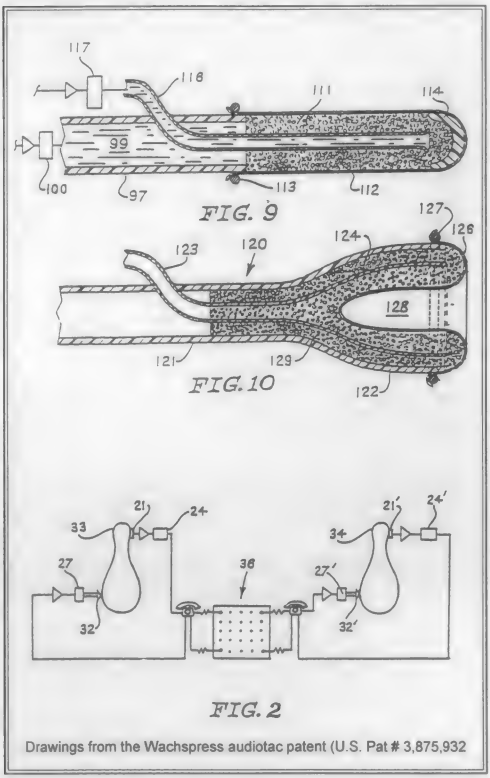
Patents are curious documents, written in their own obtuse dialect, a mix of English-as-a-second-language-style stereo instructions and antique Legalese, which belabors some points and leaves others mystifying unclear. Musing on all this, I had a flash of inspiration; a way to record Holophonically, without need of Ringo. A way to broaden and enrich the process — and scoop Mr. Z.'s patent. Naturally I'll hush up at this point. Once my Holophone is finished you can be sure I'll be looking for strange

and beautiful soundscapes, so stay busy and stay in touch.

The last fleshtone device on my list is the Auditac (Pat.# 3,875,932, granted to How F. Wachspress in 1975; now in the public domain). It's been described somewhat crassly though not inaccurately as a 'Sonic Dildo.' It's actually a very ingenious device.

The Auditac is, for me, emblematic of a fascinating period in art, technology and social evolution, the Golden Age of Porn, from about '73 to '84. The film *Boogie Nights* gives a glimpse at this period, but it's surprisingly inaccurate and condescending in one aspect: Jack Horner, the (fictional) director, is presented as being at the top of his field, yet he shoots his films in his basement, crudely and cheaply. The reality was that filmmakers put real time, money and creativity into the best films. The goal was to double porn's market by making it appealing to women, so films were given soap opera plots, designer décor, elaborate costuming, lush locations like castles and mansions (often in Europe and never cheap), beautiful bodies and lovely cinematography. Pleasure was business and business was booming.

The asethetic shift from dirty-sleazy to classy, sensual and respectable required a certain flair and inventiveness and a shift in visual styles. Pre-Golden Age and in a different genre, you can see this shift in a single film, *Fantastic Voyage*, which begins in the Cold War world of harsh lights, clicking machines, and hard gleaming metalic surfaces and transforms into fluid curves, unearthly colors, webby lacy membraneous structures. I'm sure a lot of 60s ameboid-squishy curvaceous psychedelic style was inspired by this film's luxuriant view of the microscopic world.



Drawings from the Wachspress audiotac patent (U.S. Pat # 3,875,932

Curvaceousness and fluidity — seen as feminine — was seen by designers and artists as a kind of antidote to the cruel male boxyness of the dominant style of design. That style stood for the Military-Industrial Complex, which artists in particular were getting sick of. Besides, the geometric style had been squeezed dry. Curves are much more challenging to design and construct. So museums began to fill with inflatables, floopy sculptures, billowy or dangling textiles, erotic art. All these reflected back upon their core inspiration, the female body. The question became how to approach it in a 20th century way? How to get beyond the merely visual? (For we only see the body's surface, and new imaging techniques like endoscopes, micro-and x-ray photography made a superficial view a frustrating artistic restriction.) And how to have fun with it?

Funny thing, pleasure. Philosophers have put so much effort into understanding suffering, cruelty, evil, but no one seems to focus much on the philosophical question of fun (except for Calvinists and other dreary schmucks, who discard it as a bad thing).

Through the 60s more and more young men had been fed to the meatgrinder on the rationale that Life is a Cruel Struggle, that creating suffering was somehow more decisive than creating happiness. Laughing in the face of grim seriousness is genuinely subversive. I bother to lay out this argument because, though it may be old hat to some people, it's fresh and a bit startling to my teenage friends and *that* is startling to me. It shows just how much was erased or forgotten in the Great Leap Backward of the Reagan-Bush years.

20th Century technology. Respect for the organic, flowy, feminine. Pleasure as a valid focus for inventiveness and art. The challenge of reaching the body's interior world. All these come together in the Auditac.

The Auditac — for Audio-Tactile system — is basically a big woofer-speaker capped with a funnel fitted to a hose. So that sound energy exits solely through the hose the woofer is wrapped in insulation and suspended in a box made of wood-chip plywood. Sound travels inefficiently through air, so its best to fill the hose with water. The throbbing output is applied via various hose attachments, called probes: a simple firm tube, or horn, or ...

Take a look at these drawings, folks [patent drawings labeled Fig 9 and 10, left]. Drawn in the official visual language of the US Patent Office. One distinctly phallic and the other, um, concave "into which a body part, such as a finger, may be inserted." These are made of fleshy rubber and filled with fluid saturated foam rubber. (Nowadays one could use Bioplas™, a rubber specifically designed to have the same mechanical properties (firmness and resiliency) of real flesh.) More than one hose can be run into a probe, for a more complex effect.

Now a speaker can easily act as a microphone, so if you're hooked up to the auditac and you bounce or slosh about, that activity will be transduced into signal. This signal, fed to another auditac user [see the patent drawing labeled Fig. 2] will be felt as a bounce or slosh. A "teletactile" communication. Do this over phone lines and you have literal telesex.

How well does it work? According to what the inventor told me and the bit of press his demonstrations generated, very well

indeed. To a fault. "People are touchy about touch," he says; people were embarrassed when what they thought would give them a nice little massage made them climax, publicly.

Not that everyone responded so readily. Different strokes, as they say. How Wachspress, the inventor, tried all kinds of different signals, starting with music. Lots of aurally exciting music did nothing to arouse the body (and vice versa).

Clearly, the body had its own tastes and impulses, and a new soundwork discipline, a new fleshtone aesthetic was needed. And so began Body Music. Body Music was a fleeting blip on the cultural radarscope, but I remember it, and I've dreamed of practicing it for years, ever since I heard a garbled playground rumor about it in junior high school. And I *think* I once saw — in a furtive glimpse at a naughty magazine — an ad for the Rock 'n Roll Vibrator. This was a vibrating egg with a headphone jack on its cord. A woman would plug the jack in her stereo, plug the egg in herself, crank high the volume (on Zeppelin's *Whole Lotta Love*, ran the playground rumor) and have a lovely time.

The potential for such a device was a big part of my adolescent fantasies, in which I was a Mad Scientist and Rock Star combined, the maestro of body music (I thought doing research would be fun). In time I learned how to dig through the LA patent library in search of sexual devices. A fascinating, wacky genre, with hundreds of entries. There is no official sex device category, so a bit of detective work is necessary. Usually you have to tease them out of the medical patents. (I guess this marks me as a cast-iron, card carrying nerd! I mean, geeze, looking for sexual info at the *patent library*? Eventually I discovered the Auditac, the best of the lot.

Sex aside, the Auditac can be used as a Bonefone (Wachspress recommends a tube in the armpit — I'd think it would tickle) and to lend realistic detail to simulators, such as the rumble of a jet engine or the tremble of steel wings. Like the Bonefone, this way of sending sound to the ears keeps them open to other sounds, whereas headphones would muffle them.

Godbox, infrasound, inframusic, Bonefone, fleshtone, Auditac, Body Music. All these are ways to transform sound from a feeble quiver in an invisible medium into tangible energy. Sound becomes touch.

Music at large has lost its touch somehow. Years ago, before the radio and gramophone, people made their own music by feel, vibrating them from within as they sang. Now most people leave the singing to strangers. Almost every new step of the electronic recording process is a step away from the intimate personal physicality of the human body. A bad idea, for the body is exquisitely evolved, sensitive, responsive, rich. And it's *us*. In what will be the last of my three articles for EMI, appearing next issue, I'll pick through the flawed assumptions about sound which are embedded into the recording process and how they damage and under-nourish our vital intuitive sense of music. And I'll propose a way out of this trap, with sound sculpture.

Monte Thrasher, a visual and sound artist, can be reached at (818) 846-5467 or (818) 972-9822.

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Aloha EMI People: I am exploring possibilities of liquidating my instrument business including the Waterphone. I am open to different types of arrangements including partnerships or outright buy-out with the option of my acting in research and development capacity. I have been developing some of these designs for 30 years. Besides the various models of Waterphones I have about another dozen sound devices and instruments that could or could not be included. This sale would include all printed material, brochures, demo masters, special tools and web site. Interested parties should have (1) some capital (2) a willingness to organize and run a musical instrument business. Someone with marketing skills would be an asset. Upon agreement and a signed contract I will turn over all information and details about how to prepare, assemble and tune the Waterphones and other instruments. The potential is here but it takes one or more people that can do justice to the Waterphone in terms of getting it out to the buying public. As I have been approaching my instrument business more as an artist it is now time regroup as a business. If you are interested and would like to discuss this please contact me preferably by e-mail. Phone is OK if you call early as we get up at 6 (Hawai'i time.) and go down just after sunset. Otherwise you risk the chance of reaching my phone message. I don't have a financial figure set as it depends on many factors but I am willing to negotiate. I can be reached as >Bamboomuse@aol.com< or by phone at 808-965-0955 or you can write me at p. o. box 1071, Pahoa, Hawai'i 96778 U.S.A. If you have internet capabilities you can view many of my instruments on the web at >http://www.spacebeat.com/waterphone<. I look forward to hearing from you. Mahalo, Richard Waters [14-3]

Bored of the same old Grunge, Jazz, Rap, Techno, and Heavy Metal? Would you like to assist in the exploration, creation, distortion and manipulation of the exciting tonal Universe beyond 12 Equal Temperament? Do you like REALLY weird instruments, acoustical/physical modeling, bizarre mathematics, philosophy, and strange sounds? If so, please contact "Sam Ursell", E-Mail:thcdelta@pop.ihug.co.nz I have much varied and unusual sources of information. I am also thinking of starting a magazine devoted to such sounds, instruments and philosophies. [14-3]

SURBAHAR (Bass Sitar) - Inlaid, carved mahogany & rosewood. Concert quality w/ case. $2500. Stephan 503-435-1131. [14-3]

Various **published booklets** on the **Jew's Harp** in English @ $3.50 ea plus shipping.To order, contact: (Foundation) Stichting Antro Podium, Bellinkstraat 7, 4331 GV - Middelburg, The Netherlands. [14-2]

"Three Bags Full" new CD by PETER WHITEHEAD now available. A compilation of scores for film and dance performances all composed using original instruments featured in *EMI*. Send $15 to Strange Attractor Records, 455A Valencia Street, San Francisco CA 94103. (Includes shipping.) [14-2]

Earthshaking Music Catalog is available (FREE!). Nearly 1000 cd, book and video titles of the best in world music. New shipments of instruments from Africa, India, Bolivia. Visit us in Atlanta at our new store, or on-line at www.earthshakingmusic.com. Email erthshkn@avana.net or call 404-622-0707. [14-1]

Dr. Guy Grant has started the Oddmusic e-mail list for anyone interested in experimental, ethnic and unusual music and instruments. To subscribe to this free list go to the Onelist Main Page at http://www.onelist.com and enter the name of the list you wish to join (Oddmusic). [14-1]

Pat Missin would like to correspond with anyone interested in mouth-blown free-reed instruments, including both Eastern free-reed instruments and free reeds in the western tradition, such as harmonica. Pat Missin, Cambridge House, Ings Lane, Dunswell, Hull, HU6 0AL, England; email patm@globalnet.co.uk. [14-1]

Send your $20 check to: DWIN, 6971 Rooks Ct., Frederick MD, 21703. You get color pictures plus cassette of sounds of many DWINSTRUMENTS (see "Browsing" article in the Sept '98 issue of EMI). I trust YOU, you trust ME. What a concept! [14-1]

BOOK AND CD: **Wisdom of the Impulse: On the Nature of Musical Free Improvisation**, a new book by Tom Nunn, and **Peering Over**: The Edgewater Experimental Instruments Consort, a new CD featuring 15 of Nunn's instruments with 15 players in live performance. $30 + $5 shipping for the book; $10 + $2 shipping for the CD. Payable to Tom Nunn, 3016 25th St., San Francisco, CA 94110. [13-4]

Seeking information: If you have information about bamboo saxes, or other sorts of unusual sax-like instruments, builders, history, references, anywhere in the world, please contact Ángel Sampedro del Río, Scalabrini Ortiz 1960, Villa Adelina (1607), Buenos Aires, Argentina, fax [international code, plus] 541-794-3880; email bambu@arnet.com.ar [14-1]

Reed Ghazala's **Anti-Theory Workshop** is now offering circuit-bent Incantors, Trigons, Photon Clarinets, Morphiums, Aleatrons, one-of-a-kinds, CDs and collected writings. For Reed's full-color, visually stunning brochure/catalog/fractal artwork depicting 18 instruments, CDs, friendly raccoons and more, please send $1 (or any interesting tidbit of your choice) to: Reed Ghazala c/o **The Anti-Theory Workshop**, Sound Theater, 3325 South Woodmont Ave. Cinti., OH 45213. Present web: http://www.iac.net:80/~cage/reed.html. Coming soon: http://www.anti-theory.com E-mail: qrg@anti-theory.com

Musical Instruments, Sound Devices and Sonic Sculptures in Wind, String, Percussion and combinations. Art, Inventions, & Third World translations into stainless steel, bronze and/or bamboo. Waterphones, Wind Flutes, Batutus, Bamboo Wind Bells, Water Guicas, Spring Drums and more. Price sheet on request. Or visit >http://www.spacebeat.com/waterphone< Email bamboomuse@aol.com or write: Richard Waters, PO Box 1071, Pahoa, HI 96778. [14-1]

Musical Instrument Design: Information for Instrument Making, by Bart Hopkin, editor of *Experimental Musical Instruments*, published by See Sharp Press. *Musical Instrument Design* presents underlying principles for the design and construction of acoustic musical instruments of all sorts, with a practical, hands-on approach. No other book gathers this information under one cover. Just under 200 pages long; large format; fully illustrated. $18.95 plus $2 s&h. (This covers shipping charges for U.S. air mail or overseas surface rate; for overseas air add another 25%. Customers in California add 7.25% sales tax.). Order from *Experimental Musical Instruments*, PO Box 784, Nicasio, CA 94946, USA, phone/fax (415) 662-2182, email EMI@windworld.com.

NEW from Experimental Musical Instruments and Ellipsis Arts: ***Orbitones, Spoon Harps and Bellowphones***, a book&CD compilation featuring the work of sixteen of today's most creative musical instrument makers. Each artist has one track on the CD, augmented by beautiful photos and informative text in the accompanying hardbound, 96-page book. This book&CD set is designed as a follow-up to *Gravikords, Whirlies & Pyrophones*, released by Ellipsis Arts just under two years ago and widely acclaimed. The format for the new release is smaller (comparable in size to a standard CD case, except that the hardbound book makes it fatter); containing fewer artists and selling at a lower price. Simultaneously, an abridged version of the original *Gravikords* set has been released in the same smaller format – see the following ad for details. Price for either the new *Orbitones* collection or the small-format re-release of *Gravikords*: $19.95 for book and CD. No shipping charges for U.S. air mail or overseas surface rate; add 25% for overseas air; California residents only add 7.25% sales tax. Available from EMI at PO Box 784, Nicasio, CA 94946, USA; phone/fax (415) 662-2182; email EMI@windworld.com Visa & Mastercard accepted.

GRAVIKORDS, WHIRLIES AND PYROPHONES – book-and-CD set from *Experimental Musical Instruments*, produced in conjunction with Ellipsis Arts publishing company. Devoted to new and unusual musical instruments from some of the world's most interesting and inventive instrument makers. Informative text, wonderful photographs and great recordings. Every track of the CD and page of the book overflow with the ideas and the originality of the featured builders. The original, full-sized boxed set is still in print and available from us here at Experimental Musical Instruments. It features 37 musical instrument makers in the book, with music from 18 of them included in the CD. The abridged re-release, in a smaller format matching that of the newer *Orbitones* set (see previous ad), has all of the original artists on the CD plus one new one for a total of 19. But the book, in this newer release, no longer contains photos and text on the 18 additional artists not represented on the CD. Price for the original, full-sized boxed set: $29.95; for the abridged edition: $19.95. No shipping charges for U.S. air mail or overseas surface rate; add 25% for overseas air; California residents only add 7.25% sales tax. Available from EMI at PO Box 784, Nicasio, CA 94946, USA; phone/fax (415) 662-2182; e-mail EMI@windworld.com Visa & Mastercard accepted.

The EMI Wall Chart is a beautiful 24"w x 36"h wall poster, with graphic design by Gwendolyn Jones, covered with practical reference information relating to musical instruments and instrument making. Suitable for the workshop or living room. Some of the material on the chart replicates material in the *Musical Instrument Design* book (see previous ad), but since the wall-chart format has its own advantages, you might be happy to have both. The price is $12. (No shipping charges for air mail within the U.S. or surface rate overseas; for overseas air add 25%. Customers in California add 7.25% sales tax.) Order from *Experimental Musical Instruments*, PO Box 784, Nicasio, CA 94946, USA, phone/fax (415) 662-2182, email EMI@windworld.com.

Making Simple Musical Instruments: A Melodious Collection of Strings, Winds, Drums & More — A book by Bart Hopkin, editor of *Experimental Musical Instruments*, published by Lark Books: A collection of plans for home-buildable musical instruments, ranging in difficulty from simple to moderate. The book is written for a general, non-specialist audience, and the approach is non-technical. The instruments aren't so very far out: most of them relate to familiar instrument types and are playable as such. Yet even experienced experimenters will find some new ideas here. It's hardbound, with 144 big and very full pages, lots of color, beautiful photos & illustrations; price $24.95 plus $2 s&h. (This covers air mail within the U.S. or overseas surface rate; for overseas air add 25%. Customers in California add 7.25% sales tax.) Order from Experimental Musical Instruments, PO Box 784, Nicasio, CA 94946, USA, phone (415) 662-2182; email EMI@windworld.com. Visa/MC accepted.

Air Columns and Toneholes: Principles of Wind Instrument Design is a spiral-bound booklet containing the four articles on practical wind instrument acoustics by Bart Hopkin that appeared in EMI in 1992 and 1993. The articles have been revised and improved, and there are several additional features included. Published by Tai Hei Shakuhachi; available for $14.00. (This covers air mail shipping within the U.S. or surface rate overseas; for overseas air add 25%. Customers in California add 7.25% sales tax). Order from EMI, PO Box 784, Nicasio, CA 94946, USA, phone (415) 662-2182; email EMI@windworld.com. Visa/MC ok.

SUBSCRIPTIONS TO EMI: $24/yr for U.S.; $27/yr for Canada & Mexico; $34/yr overseas. IMPORTANT NOTE: EMI will publish its last issue of the quarterly journal with the June 1999 issue. (Other facets of EMI's operations will continue in full force.) In ordering subscriptions during this last year of publication, you can choose:

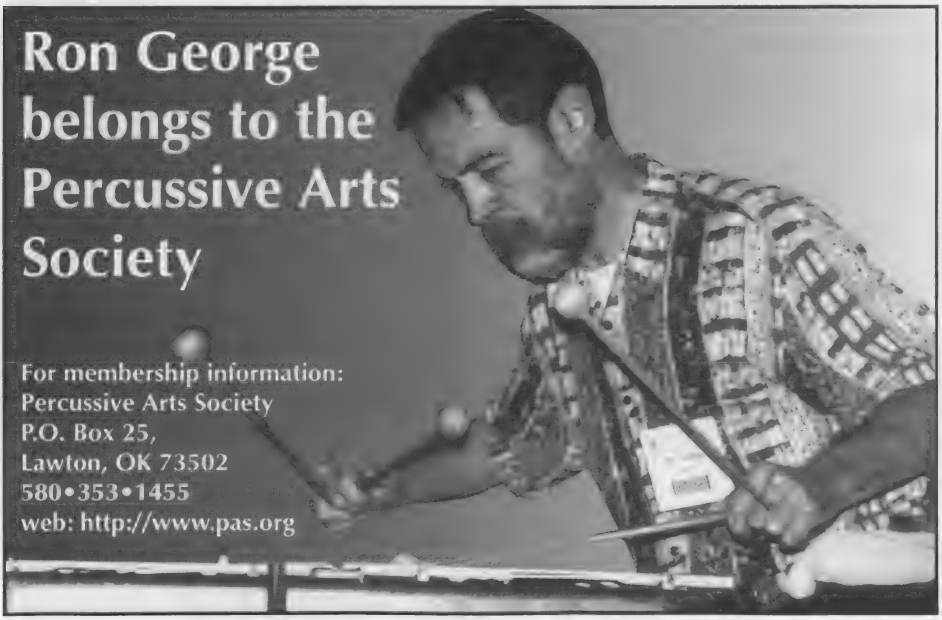
1) Get a full year's subscription at the regular prices indicated above, backdated to include all four issues for the year, or

2) Get a part-year subscription at pro-rated cost, as follows: Through May '99, one remaining issue at $6 in US, $6.75 Canada & Mexico, $8.50 overseas. (Even after June 1999 you'll still be able to purchase any or all of the issues you missed as back issues -- see the information in the next ad.)

Order from EMI, Box 784, Nicasio, CA 94946, USA, phone/fax (415)662-2182, email emi@windworld.com. Visa/MC accepted.

EMI BACK ISSUES: Bound volume sets Vol 1 through Vol. 12: $17 per volume. (Each volume set contains all of the issues of one volume year, photocopied and paperback-bound under one cover. The photocopies are a step down in quality from the original press runs, but they are decent as photocopies go, and they are fully readable.) Individual back issues from Volume 13 #1 through the current (Vol 14 #3) are available in the original press run at $6 each. These prices cover air mail shipping within the U.S. or surface rate overseas; for overseas air add 25%. Customers in California add 7.25% sales tax. Visa and MasterCard accepted. Order from EMI, PO Box 784, Nicasio, CA 94946, phone/fax (415)662-2182, email emi@windworld.com, or write for a listing of back issues and their contents. Corresponding cassette tapes are available for later volumes; see information below.

CASSETTE TAPES FROM EMI: Each cassette in the EMI cassette series contains music of instruments that appeared in the newsletter during the corresponding volume year, comprising a full measure of odd, provocative, funny and beautiful music. Volumes 6, 8, 9, 10 11 12 and 13 are available. (Vols 1 - 5 and 7 are sold out; Vol. 14 will be available after August, 1999). The price is $8 per cassette. No additional shipping charge for air delivery in the U.S. or surface delivery overseas. For overseas air add 25%; in California add 7.25% sales tax. Order from EMI, Box 784, Nicasio, CA 94946; phone/fax (415)662-2182, email emi@windworld.com. Visa and Mastercard accepted.



BAMBOO AND MUSIC, Part 2

By Richard Waters

This is the second half of a two-part article on the ins and outs of musical bamboo. Part 1 appeared in EMI's Dec 1998 issue.

Internode length is the distance between the spots where the branches come off the bamboo culm. On the inside of the culm where the branches come off is the node wall. The node walls are not of a strong material like the culm wall is, and they can be removed by knocking them out from the inside with a rod or pipe. For larger instruments like giant marimbas, long internodes are preferred. Short internodes create a more rigid culm (stiffer), which restricts the frequencies to which the culm itself can respond. However, a bamboo that may be great for wind or stringed instruments may not be so good for percussion and vice versa. Some experimentation is required.

Stamping drums, nose flutes and didjeridus: Stamping drums (also called stamping tubes) are tubes, open at the upper end and closed at the lower, which are sounded by striking them end-on against a firm surface. The resulting jolt excites the air inside, bringing out a brief but clear pitch at its resonant frequency. The traditional bamboo in Hawaii used for stamping drums and nose flutes is *Schizostachyium glacifolium*, which is a clumping bamboo with very thin-walled, very straight and very long internodes, with some internodes up to 3 ft. (91.4 cm) in length. These characteristics allow this bamboo to be used effectively for stamping drums and flutes as they are easy to play due to light weight and they resonate very well when struck against the ground or blown into. As the walls are thin, very little shaping of the flute holes is required.

The top end of the stamping drum is open as are all of the interior nodes except the bottom one. The interior nodes are knocked out using a small piece of pipe or metal conduit. For stamping drums, pads are usually put on the bottom or a piece of thick cloth or leather is tied around the bottom end. Alternatively, a rug on a concrete floor or heavy socks on a brick also work well for stamping drums to be stamped against. As mentioned above, the tropical bamboo *S. glacifolium* is excellent for stamping drums. Other bamboos will work, but weight is a factor. (See photo #7, showing a three-drum stamping drum with holding stand in Bali. Note handle on the drum on the right which is a branch.)

Most think of the Aboriginal didjeridu as made of Gum trees hollowed by termites. The original didgeridus were made from an indigenous Australian bamboo known as *Bambusa arnhemica*. Later when the bamboo became in short supply or was not available the Didjs were made from trees.

Another bamboo that has thin walls and long internodes and is very strong is *Arundinaria amabalis*. This running bamboo will grow in temperatures to 10° F. Frequently sought by flyrod makers for its strength and resilience, *A. amabalis* is available in many of the bamboo nurseries across the U.S. and elsewhere, and the culms are imported.*

Traditionally in Japan and the middle part of China the genus *Phyllostachys* is widely utilized for musical instruments. There are hundreds of varieties in different sizes and colorations. These are hardy spreading bamboos and are the most widely planted group of bamboos across the U.S. mainland and Europe. They are easily identified by alternating sets of two branches and a slight culm indentation that also alternates from side to side on each internode. The most widely used in Japan are *P. bambusoides* (Medake), P. *h. pubescens* (Moso), and *P. n. henon*. These timber bamboos are considered of the highest quality but there are many others.. *P. bambusoides* is prized for shakuhachi flute making as well as for other arts, crafts, and construction. I use the *Phyllostachys* for batutus (see photo #5 in part 1 of this article), spring drums (see photo #8) and other designs.

I also use Moso *(P h. pubescens)* for wind flutes. (These are flutes sounded by the wind. Each internode section in the bamboo forms a separate air chamber with a single hole which sounds as the wind blows over it.) The short internodes towards the base of the Moso culm allow for more tones in a short distance. Instead of having a six-hole wind flute six feet long, with base sections of Moso I can have a six-hole wind flute three feet long. (see photo #9) However, the thick walls of Moso in the base sections of the culm create more work in terms of shaping and carving the tone hole lips.

In Japan, where bamboos have been utilized for centuries, methods not found elsewhere have been developed for the preserving and curing of *Phyllostachys* culms. The freshly harvested culms are cut to lengths of 10 -15 ft.. These are stood in pyramid bundles out of doors in shade during the day and brought inside at night. These culm sections are submerged in vats of hot caustic soda. This brings the natural oils of the *Phyllostachys* bamboos to the surface which are then wiped with cloths. The natural oil is utilized through heating as a surface finish. Any culms that show any sign of bug infestation are destroyed by burning

*For more information on where to obtain bamboo varieties such as these, refer to the ABS Source List, available from the American Bamboo Society. This important resource is discussed in more detail later in this article, and contact information for ABS appears in the article's resource list at the end.

immediately. The shakuhachi method is to slowly roast the culm sections over a charcoal fire while wiping away the oils.

This Japanese process can be somewhat simplified for those not wanting to set up an elaborate hot vat system or a charcoal fire. Propane torches or the coals of wood fires can be used. If attention is paid to the timing and wiping of these oils the surface can be darkened and a rich finish attained. If attention is not paid then the surface of the culm is charred and damaged.

This same slow heating process can be utilized for bending bamboo to arcs or curves or to straighten bamboo. A little leverage is required. The pressure must be maintained while the culm is cooling which usually only takes a few minutes. Or the culm may be dipped into water to cool it.

Depending on wall thickness, diameter, and lengths, as well as site and humidity, the curing could take anywhere from a several months to two or three years . When the color changes and the bamboo becomes much lighter in weight the process is complete or close to it. According to U.S. shakuhachi maker, Monty Levenson, the Japanese cure their shakuhachi bamboos for three years and in the process loose many due to cracking.

Preservation Methods

One toxic-free method to keep bamboo bug/fungi free is to pay attention to the time in which bamboos are harvested and to the age of the bamboo culm. Below is an age-old recipe utilized in several bamboo countries. With this method, timing is everything.

Harvesting in a dry period of the year in combination with what is known as the "Young Period" greatly increases the chance of no bugs and no fungi and reduced cracking. The "Young Period" is when the new shoots are at their maximum height but have not leafed out yet. During this period of time the starch in the older culms goes to the younger ones which makes the older culms less desirable to bugs and fungi. For the *Phyllostachys* genus this "Young Period" of time would fall between late winter to late spring depending on the species and location and climatic conditions. For tropical genera like *Bambusa* and *Dendrocalamus* this period of time would be in late fall into winter.

A third-world addition to the above is to harvest bamboo during the dark of the moon. The scientific community has examined the moon possibility and found no correlation between less bugs and any of the moon phases. Still this belief persists and some people in India and elsewhere pay attention to the moon phases for the harvesting of bamboo.

Another toxic-free preservation method is to cut the freshly harvested culms into shorter sections and soak them in fresh water or in a fresh-water mud hole. The latter is more effective as the microbes in the mud eat the culm starch. The fresh water soaks out the starch but takes longer, like several weeks to a month or more. There is the problem of curing a water-soaked culm without it checking or splitting. Shorter sections and thinner walls make for less cracking when soaking in water. The curing process needs to be very slow with water-soaked bamboos in a very airy space. Some bamboos are more susceptible to cracking but I know of no data available on this yet. This water soaking is a method used by the Argentine bamboo instrument designer, Ángel Sempedro Del Río, who uses *Phyllostachys* and other bamboos for ocarinas, saxophones and drums.

Salt water is not recommended for any bamboo preservation process as the salt remains in the culm wall and draws water to itself which promotes fungi and rot.

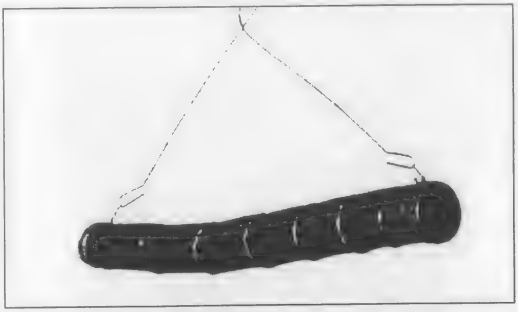
The heating method describe above is also considered a preservation method even for non-*Phyllostachys* bamboos. If bug eggs are in the bamboo they are eliminated. The flavor of the bamboo becomes less inviting due to the change in oils and the smoke penetration. Monty

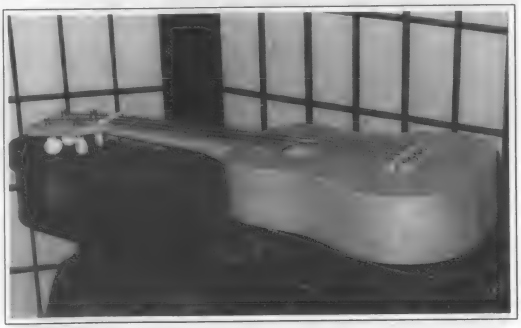
Photo #8 — above: Bamboo Spring Drum by Richard Waters

Photo #9 — immediate below: Bamboo Wind Flute by Richard Waters.

Photo #10 — bottom: Ukulele made of bamboo by George Soper, Volcano, Hawaii.

Photo #10 by Sian N. Rufo.





Levenson reports that using the Japanese *Aburanuki* (heating) process he has had no problems with bugs.

One low-tech preservation method that is rapidly gaining in popularity is the boric-acid-in-a-bucket method. The boric solution comes under many trade names. (Tim-Bor and Clear-Bor are two) and has been recently adopted by the timber industries in favor of arsenic/copper for woods in the U.S.A. There is also a fertilizer product called Solubor (US Borax) that can be used as a preservative chemical (same ingredients) that is so much cheaper and does the job. Boric acid is considered less toxic for humans than some of the copper/arsenic preservatives, but cautions must still be taken so as to not inhale or ingest it. The bucket method is simple as you take a bucket full of solution to the bamboo grove, cut the desired culm(s) close to the ground and stand the base end in the bucket. The leaves will suck up the solution into the walls of the culm. A color dye can be included in the solution so it is easy to track how far it goes up the culm, as you may not want to use the top portion Once the solution is in the walls, which usually only takes 24-36 hours, it is time to take the culm out of the bucket. Cut the culms into usable lengths and cure them in an airy place with little or no sun and no direct wind. Leaving on the branches and leaves will speed the curing process but may also promote cracking due to the water leaving too fast.. The bucket method is perfect for musical crafts people who only require a few culms at a time. With the bucket method there is no large outlay of money for equipment and the bucket process is simple.

For wind instruments I would not recommend this process unless the finished product is to be sealed extremely well.

Preservatives cannot be applied conventionally to bamboo as to wood because the exterior and interior of bamboo are resistant to penetration. Only the open (cut) ends are able to take up fluids. Freshly harvested bamboo can be soaked or submerged in vats of water-based preservatives.

Humidity

Moving or shipping a bamboo instrument from one location to another should be done with caution. Humidity is the problem: the rapid change from a high, moist humidity to a low, dry humidity has cracked many bamboos. This is complicated by forced-air heating systems and other devices that dehydrate rooms. Bamboo musical instruments, like many instruments, should be stored in cases or a bag in a room without extremes of hot/cold, dry/wet. If in doubt when shipping or traveling with a bamboo instrument, seal the bamboo in a plastic bag as tightly as possible and keep it sealed at the destination until the bamboo has had a chance to slowly adjust to the changes in humidity. The idea is to slow the movement of moisture in and out of the bamboo culm wall.

If the moisture has been stabilized in a mature culm preferably at a low point and the bamboo is sealed, cracking less likely to occur. Bamboo that were harvested at 5 -8 years old and have been aged for a long time (several years) are less susceptible to cracking and checking.

Binding with cord, wire or other materials is a traditional way of reinforcing the bamboo against cracking.

When making bamboo wind flutes I reinforce the exposed end interiors with cast epoxy and glass fiber. This helps the wind flutes to resist the wet/dry, hot/cool, expansion/contraction forces at work on them. As the interior cavities of the wind flute resonator are open to the air via the apertures, I seal the interiors by pouring tung oil into each chamber and swishing it around before pouring the excess out.

Several instrument designers and bamboo artists are now experimenting with PEG -1000 (polyethylene glycol). This testing with bamboo is proving very positive in terms of reducing cracking, as this material is used for this same purpose with wood. This liquid plastic can be placed into the culm walls by several methods (soaking, vacuum, and with a pressure pump) and in the process replaces all water within the culm wall.

The Sound of bamboo.

Once when sitting alone in a big grove of timber bamboo in Central Hondouras, I heard the tops begin to clatter and rub each other making a most unusual percussion concert. For a moment I thought a troop of monkeys or other wild animals were moving through the tops of the bamboo. The hair on the back of my neck stood up. I looked up but could see nothing. It had only been the wind moving the old, dry, cracked culms, but the sound was eerie and definitely got my attention.

Bamboo goes way back in time and in the human psyche. To quote my friend, bamboo instrument designer/player, Darrell DeVore — "Bamboo was making music a million years or so before any humans were on the planet to hear it." I would like to add that surely the first humans were aware of the potential of bamboo for making sound and that "cracked culm" percussion instruments may have been some of the earliest of human musical instruments.

Most culm sections that are cracked and are medium to large in diameter make very good percussion instruments without much preparation other than sawing loose a section, cutting off branches and smoothing the edges. The crack has opened the culm which allows the sound out. Select a section of cracked culm and sever it just above one node and below the node under it. Take a large branch section and start tapping in different places and note tone changes. On each side of the split the tone will differ.

Add guiro (scraper) effects by using a wood file or a fine-tooth saw to cut grooves parallel to each other but perpendicular to the culm length. Vary the distances between these cuts to create different guiro sound patterns. As the culm is round, different series of guiro cuts can be placed in different areas. Make some cuts wide, some deep, some close, some far apart, and some in numerical arrangements 4, 5, 7 etc. Make some cuts with one tool like a pull saw or with a hack saw, and others with something different like the edge of a triangular or round wood file. These differently shaped cuts will give different sounds depending on what kind of sticks are used. (see photo #8)

To make scraper sticks for the bamboo guiro, take another section of a culm and split it into 0.64cm. (1/4in.) sections. Carve several bamboo-stick mallets with one end larger than other and with one side rounded and the other side with an angle. These should be at least 30cm (12 in.) in length. On one end glue a piece of leather or bind with cord for a softer sound. Sand all sharp edges. Use a dust mask. This type of bamboo guiro stick will give a wide range of sounds.

The above approach is beginning bamboo instrument making, It requires a few handtools and is easy to get the hang of with fast results.

Many other percussion devices can be created with pieces of cracked bamboo. Darrell DeVore makes a bamboo bullroarer from a flat section with guiro ridges cut into it that can be rubbed with the handle of the bullroarer. Two sound devices in one.

An easy wind-chime project for bamboo culms, cracked or not, is to cut the culm into different lengths. If the culm sections

are large and cracked, then split the culm further into long flat pieces for a different sound. For the fullest sound, drill holes at 1/5 of the length from the end and slide the end of a dacron cord through the hole and on the back side tie an overhand or figure-8 knot to keep the cord from slipping back out. Or in the case of whole culm pieces, tie several half hitches around the 1/5 point. Make the string lengths short so the individual pieces do not tangle with each other when suspended. Tie all these individuals to another piece of bamboo or to a smaller green culm top that you can shape/weave into a circle or curvilinear shape. By changing the spacing between bamboo pieces you program what collides and how frequently and easily. Tie a Dacron bridle to the top and hang.

Cracked culms are also good material for bows, bridges, picks and tuning pins. There is a market potential for bamboo bows for stringed instruments. If the split culms are thick enough and of large enough diameter they can be planed down to flat, thin boards which are very strong and can be used for a wide range of musical applications, especially those requiring laminates such as the instruments of the bamboo orchestra described above. Here in Hawaii the first ukuleles using processed bamboo have just been constructed by George Soper. (see photo #10) These processed bamboo materials, which are for the most part used for finished flooring and paneling, are available across the U.S.A. as well as in other countries. (see ABS source list)

I try to harvest to meet my expected needs for two to five years ahead so that I have choices. I am always on the lookout for quality bamboo for both musical and non-musical designs. A fun and informative way to get access to free bamboo culms is to join your local chapter of the ABS or the bamboo organization of your country. Thinning of the groves, harvest/digs and rescue missions (the bulldozer is coming) are organized by local bamboo organizations and/or members.

Whatever your sources of bamboo culms, check your stock frequently and remove and destroy any culms showing bug activity, or you could loose it all. As a telltale sign, look for little piles of powder.

Tools

For harvesting, use a small coarse-tooth pruning saw. For finish cuts, most Western-type hand saws feel awkward, and they don't cut bamboo well. An exception is the short finish saw by Sandvik called a "Razor Sharp" which has fine teeth that are heat-hardened and give a smooth "push" cut. Japanese fine-tooth pull saws (*Dozuki*) are small, lightweight, and give a smooth, fast, cut in bamboo. For larger projects with many cuts, a fine tooth blade on a chop saw or compound miter saw will speed progress. Band saws work well for more intricate cuts.

Bamboos can be split with a number of tools including a traditional cleaver and an Iron-tree wood mallet, both from Bali. I sometimes use a traditional Japanese tool that looks like a heavy-duty, old-fashioned straight-edge razor. I have also used combat knives, machetes and hatchets driven with metal, wood or rubber mallets or hammers to split bamboo. Bamboo is hard, so sharp tools are a must, but most bamboo culms split easily. There are numerous sources for these tools usually sold under the heading Japanese woodworking tools or woodcraft. (1-800-535-4482 for a catalog. Also, see an 800-number directory and the ABS Source List.).

Use Forstner bits for cutting holes as they leave a clean cut and tend not to split the culm. Small holes are sometimes burned into the culm wall with hot metal rods or bolts.

Cautions: Many bamboos when split have very sharp edges, so some care should be taken . These sharp edges can be sanded, scraped or carved to a smoother, gentler edge. An additional danger in working bamboo lies in the high silica content. The silica saw dust created when sawing and sanding bamboo can be injurious to the lungs, so wear a protective mask.

I suspect that many surface sealers will work with bamboo. Bear in mind that due to the silica it will not penetrate but stay on the surface. Polyurethane is used by many for bamboo while Tung oil is the favorite in China. I like marine grade "Teak" oil which is mostly Tung oil. Petroleum products like kerosene and spent motor oil or diesel oil are used in some bamboo countries but their toxicity is in question. Waxes are used with bamboo, and Green Wood Wax, available from wood/tool supply houses, can help keep your bamboo from splitting. I have described elsewhere methods for bringing the natural oils of the *Phyllostachys* genus to the surface, which puts a very nice finish on this family of bamboo.

Bamboo is a material that you can grow in your back yard. It is sustainable and renewable and is of the highest quality in terms of strength, hardness and flexibility. While it is maturing for use it will be a great visual addition to your property as well as a source of vitamin/mineral rich bamboo shoots to eat. The financial savings in growing your own musical materials and the satisfaction of making musical items from a quality, home-grown, fast-growing plant are good reasons for turning to bamboo. The inherent design in a bamboo culm, with its enclosed but separated air chambers, allows for a very wide range of musical design possibilities. Bamboo can grow at extremely fast rates with the known record of 1.24 meters (49 inches) in a 24-hour period. The varieties of bamboo are staggering in their numbers (75 genera with 1200 species) and they can be grown in wide climatic ranges on difficult terrain. Many are excellent for erosion control and wind breaks.

For a detailed list of bamboos within the U.S., with their descriptions and where to obtain them, consult the Source List available from the American Bamboo Society. Also in the Source List is a Materials Source List where contact points for bamboo musical instruments, processed materials and cured bamboo culms are listed. New this year to the ABS Source List is the Utilitarian Code which will assist in selecting bamboos for arts, crafts, and music. You may view these Source Lists on-line or obtain a free copy from the ABS (see this article's Resources List below).

Bamboo: you can't beat it — or maybe you can? As well as bowing, blowing, and plucking it. Bamboo is the Musical Grass.

RESOURCES

If you have questions contact me at >Bamboomuse@aol.com< or p. o. box 1071, Pahoa, Hi. 96778 or 808-965-0955 (6a.m.-6p.m.— Hawaii time)

Bamboo Kite Music: http://members.aol.com/woinem1/indexpar

BAMBOO MUSICAL INSTRUMENTS:

Darrell DeVore. p.o. box 75142, Petaluma, Ca.94975 ph. 707-778-0729

Lindsay Pollack. Kin Kin Rd, Kin Kin, Qld, Australia 4571.
Ph#: code 61 7 54854343, Fax#: 61 7 54854463

John Neptune. 1091 Kita Komachi, Kamogawa-shi, Chiba-ken, 296-01 Japan; Tel: 81 470-97-1534; Fax: 81 470-97-0939; http://www.pacific.net/~jneptune; http://www.music.co.jp/~jneptune

Monty H. Levenson. Tai Hei Shakuhachi Flutes, P.O. Box 294, Willits, CA 95490; Tel.:707-459-3402; FAX: 707-459-3434; e-mail monty@shakuhachi.com; http://www.shakuhachi.com

George Soper,. bamboo ukuleles. P.O. Box 41, Hawaii national Park, HI 96718; Ph 808 985-8839

Richard Waters, musical instruments/sound devices/sonic scuptures. e-mail Bamboomuse@aol.com; http://www.spacebeat.com/waterphone

The Jew's Harp Guild, through Mark Poss.
Email: mposs1@cyberhighway.net; http://www.cyberhighway.net/~mposs1/

Pluck, a publication for Jew's Harp players/makers.
P.O. Box 14466; Seattle, WA 98114

Source for Kubings and other instruments:
Lark in the Morning. PO Box 1176, Mendocino, Ca.95460;
phone 707-964-5569;
http://www.mhs.mendocino.k12.ca.us/MenComNet/Busin ess/Retail/Larknet/larkhp.html

Organizations:
American Bamboo Society. 750 Krumkill Rd. Albany, NY 12203-5976; http://www.bamboo.org/abs/ (Links and contact points for many worldwide bamboo organizations can be found here, including your local U.S. chapter.

Source for bamboo books:
Tradewinds Nursery/Gib Cooper. 28446 Hunter Creek Loop, Gold Beach, OR 97444; phone/fax 541-247-0835; e-mail bambugib@harborside.com

Also see ABS web page for book sources.

PUBLICATIONS (in order of my preference)

1. *IL-31 Bambus-Bamboo* (ISBN 3-7828-2031-2)
Softbound book is about $60 mailed to you. If you only can afford one book get this one. It is long on detailed photos and drawings in black and white from around the world showing all sorts of bamboo structures, joinery, weaving, and tools & methods. The text in German and English is accurate, detailed and to the point. Published by the Institute of Light Weight Structures in Stuttgart, Germany. Available through Trade Winds Nursery in Gold Beach Oregon (address above).

2. *Bamboos Rediscovered* by Victor Cusack. (ISBN 09595889 8 1)
This manual on bamboo is by a very knowledgeable artist, musician, bamboo nurseryman, and author. His easy-to-follow steps in making several items from bamboo including Pan Pipes will lead you into this interesting world. This book has good growing and propagating information also. Victor is precise and to the point and the cost of his publication is low. I hope this will be released in the U.S. soon.

3. *Local Tools, Equipment and Techniques for Processing Bamboo and Rattan* (INBAR Tech Report #9). ISBN 81-86247-17-3 by R. Gnanaharan and A. P. Mosteiro
It has a long name and is only 81 pages (only half of which is on bamboo), but what a well done, informative bamboo (and rattan) book this is for those who work either one or both. Full of condensed excellent details from all the bamboo countries and international experts. This spiral bound, small, but well illustrated book is in fact, as they bill it, "an illustrated Manual". It has *the* most tool details including processing equipment, hand tools and sources for these, as well as sections on harvesting, preparation, processing and finishing.
Available from Tradewinds Nursery for the amazingly low price of $10 which includes shipping.

4. *Chinese Bamboo Handicrafts*, ISBN 7-5038-1831-x .
Published by China Forestry Publishing House. This book is amazing in the variety of art objects made from split bamboo, bamboo root sections and whole culms. Strip weaving is a very advanced art form in China as this book well documents. Not much here on musical instruments but shows a wide range of applications and approaches to working bamboo. Mostly color photos and lots of them with a small amount of text in Chinese and English. Price varies from different sources; $50-$70. Try Tradewinds nursery above or your local book store. Of all three this is the coffee table book.

Richard Waters intertwines three areas in his work — art, bamboo, and music. For over thirty years he has been inventing, building, and performing on new kinds of musical instruments, sound devices and sonic sculptures, including his extraordinary water-and-metal instrument, the Waterphone. His work is exhibited widely in galleries, museums and music stores and he and his instruments are on numerous recordings and movie/tv sound tracks. While living in California Richard also operated "A Bamboo Shoot" nursery, propagating & shipping bamboos worldwide. He has been active in the American Bamboo Society (ABS) for the past 15 years and has served on the National and Regional boards of directors as well as initiating the National ABS Arts/Crafts/Coordinator position. Richard can be contacted at his studio on the Puna Coast of the Big Island of Hawaii where he also grows more than a few varieties of bamboo.

RECORDINGS REVIEWS

By Warren Burt, Bart Hopkin, Dean Suzuki and René van Peer

KRAIG GRADY & BRAD LANER: **MUSIC FROM ANAPHORIA**

Transparency Records, 0003. Available from Transparency Records, Box 81-1821, Los Angeles, CA 90081. Distributed by Forced Exposure, 226 Lowell Street, Somerville, MA 02143. Fax 617 629 4774; www.forcedexposure.com

Kraig Grady is a Los Angeles based instrument builder and on this recording, he has created an alternate reality, a fictitious but believable culture with a strong musical heritage. Grady's Anaphoria appears to be the subject of thorough anthropological and ethnomusicological study, with its own language, rituals, mythology, history, rune-like alphabet, and elaborate musical tradition. A visit to Grady's website (http://www.anaphoria.com) offers up the history and tradition of Anaphoria, along with photographs of their (i.e. Grady's) instruments and a discussion of the Anaphorian tuning system. For this recording, Grady and Laner have concocted appropriately exotic music, with the help of the enigmatic Banaphshu and a few other guest performers, including Jim French who offers up some original woodwind instruments. The pieces include ritual and ceremonial music, as well as music for pleasure. The resultant music is more than evocative; it truly creates a parallel reality that is beautiful and compelling. Grady's instruments appear to be primarily percussion, including mallet percussion, some gamelan-like pieces, others in the vein of Partch's diamond marimba, as well as some unpitched percussion instruments.

—DS

JEFFREY KREIGER: **ACDCVC**

¿What Next? Recordings WN0022, now available from O.O. Discs, 261 Grovers Ave., Black Rock, CT 06605-3452; e-mail: cellioo5@aol.com PO Box 344, Albuquerque, NM 87103

One of the reasons why I have a passion for contemporary music is that it can change the role of instruments from being objects that serve to uphold a musical structure to being the subject on which compositions focus. The development of extended techniques and of sound-processing technology has given (and still gives) musicians ample opportunity to explore the sonic range of their instruments, and calls on their own imagination to put these explorations to musical use. On the other hand this has also grown from a changed conception by composers of what constitutes music — moving away from structures based on melody, chord progressions and fixed time signatures towards a sound-oriented approach.

The album *ACDCVC* of cello player Jeffrey Krieger testifies to the diversity, the intensity and the beauty achieved through that approach in compositions by Sarah Hopkins, Alvin Lucier, Kaija Saariaho, N. Sean William and Ronald Halier. The pieces make use of overtones, of heterodyning caused by microtonal variances between two strings, of the shrill tones occurring when the strings are played close to the bridge. The electronics highlight certain aspects of the resulting sound. In Hopkins' *Cello Chi* they amplify the lush and rich timbre to the point where you feel as if embraced by way of your ears. Although recording details of *Indian Summer* by Alvin Lucier are not given, I would be surprised if any electronic treatment was used other than a very judicious placement of the microphones — the beats and vibrations of the two strings just a few cycles apart are captured in all their throbbing and pulsating detail, as is the dark hiss of the hair on the bow grazing them ever so carefully.

Saariaho has Krieger play different gestures, from sustained to rapidly bowed notes, chords, overtones and riffs. But then she has him hover as if suspended in a strong magnetic field generated by different processing units, pulling the sound this way and that while it's being played.

Krieger's instrument was especially made by Tucker Barrett to be used as an interface between the musician and electronic controlling devices. As is stated in the text on the sleeve, however, its intrinsic character "is never erased by the technology. If anything, the electronics are used here to enhance those essential qualities, to draw us into the cello's sound world and allow us to experience it perhaps more as the cellist himself does — ears close to the source, attuned to every microscopic detail and nuance of timbre and pitch." Leaves nothing for me to add.

— RvP

STEVEN M. MILLER: **SUBTERRANEA**

Robi Droli fy7008. Contact Steven M. Miller: The College of Santa Fe, Contemporary Music Program, 1600 St. Michael's Drive, Santa Fe, NM 87505

The visual artwork that accompanies a CD often gives an indication of the music on the disc itself. This is quite clearly the case with Steven M. Miller's *Subterranea*. The picture on the insert looks like a radiant wisp of smoke, curling in upon itself and with an intensely bright spot in the center of the curl — as if the energy that makes the smoke shine lies concentrated there. Opening the jewel box you'll see a spiral on the CD that lightens up as it approaches the transparent circle in the middle, losing itself in a field of ochre below it on the tray. That field of ochre is part of the original picture: a photograph in lush colors of a sunrise near Gunung Merapi, an active volcano on Central Java, taken by Miller during a one-year stay in Indonesia.

Much the same the music is inspired by, and at times based on, impressions and experiences he accumulated there. On some tracks he uses recordings of the *suling* flute as his primary sound source; on others he works with soundscape recordings he made. Sometimes these sources are still more or less recognizable. In *The Shadow of the Mosque* you hear sounds that he probably taped inside and around a house of worship. There are small bells, people chanting, but also traffic passing by, and one occasional horn honking. These are interlaced with the most gorgeous tones, drones and washes of chords that you could wish your ears to be caressed by. These, Miller says, are all the result of processing

the acoustic sounds in the studio, taking individual elements and treating them in various ways. Most of the tracks were improvised. Some of these, such as *The Shadow of the Mosque*, consist of different layers mixed together on a multi-track. But he has also recorded improvised treatments directly to tape. One of these pieces is *Lost Temples*, which is based on a phrase on the *suling*. As in all other pieces the lushness of the sounds invites the listener to follow the progress of the processing along the paths it is taking. The timbres are reminiscent of Brian Eno's ambient music, but Miller goes way beyond creating pensive, brooding atmospheres. He singles out certain aspects and sends each along a trail on which it gradually gets transformed. The starting point lies already somewhere down these paths — a slightly dissonant swelling and withdrawing loop, with an insistent pulse underneath it. Out of this flute-like double tones emerge and a metallic sound as of from a coin spinning ever more slowly on its side, while a dark drone comes bulging up from deep down.

Just as with the pictures, the beauty of the colors, the colors of the initial impression, are retained. In recollection the image takes on new shapes — proportions and relations and the way these are associated within the image and with images that preceded and succeeded, have changed over time and created a world of their own. A seductive, fictitious world that lures you along in its dazzling vortices. Only to let you go at the very end where, surrounded by dense rolling chords, the *suling* serves as a gateway to the everyday world in which all things are distinct and clearly-defined, and are where you expect them to be.

— RvP

MÖBIUS OPERANDI: **WHAT WERE WE THINKING?**

Möbius Music MM9801 (Möbius Music, 1583 Sanchez St., San Francisco, CA 94131, www.mobiusmusic.com)

Möbius Operandi is a new music ensemble comprised of instrument builder Oliver DiCicco, who created all of the instruments used on this recording save one, and musicians Peter Whitehead (himself an instrument builder and creator of the single instrument, a fipple flute, not made by DiCicco), Christie Winn, Pamela Winfrey (on the staff of San Francisco's famed Exploratorium, home of sound sculptures by Doug Hollis and others), and Jason Rainier. What sets this apart from most other recordings of experimental instruments is the type of music which the ensemble plays: pop music. All members contribute to both lyrics and music, though the style cuts through a large swath. And while it is pop music, it is remains experimental, and is often quirky, but also intelligent and engaging. The music is essentially tonal or modal, with a regular beat, though the solo reed improvisation in "Fourteen Hundred Hours" derives from free jazz. Other bits of free improvisation include what sounds like speaking in tongues, squealing balloons sounds and the like, though all in the context of avant pop. As a point of reference, this CD is in the same general arena as Hal Wilner's tribute to Charles Mingus, *Weird Nightmare*, the CD which featured many of Partch's instruments with performance by downtown New York jazz luminaries, as well as some vocals by the likes of Elvis Costello.

DiCicco's instruments are sonically and visually beautiful. The Timbajo is part marimba, part drum, while the Bass 2 is like an elongated pedal steel guitar that can be played with or without a slide. The Kalimba emits a sound that invokes the mallet instruments of Partch. All in all, DiCicco has created a host of stunning percussion, string and wind instruments which are presented in a musical context that is approachable, yet never pandering to mere popular taste.

— DS

NICK DIDKOVSKY, STEVE MACLEAN AND C.W. VRTACEK: **FLIES IN THE FACE OF LOGIC**

Pogus CD, Pogus 21008-2; Pogus Productions, PO Box 150022, Van Brunt Station, Brooklyn, NY 11215-0022.

ALISTAIR RIDDELL: **STURM UND DRANG**

Archisonic CD 270198 from http://alphalink.com.au/~amr/ccp/

Here are two CDs which extend the piano in different ways. One uses sampling and sequencing devices to extend the possibilities of the piano — strictly speaking, this is not "piano" music, but "piano-sound" music — while the other uses computer-controlled devices to play acoustic pianos in various ways.

Alistair Riddell is an Australian composer who, in 1981, decided to build a computer interface to play the piano. He wanted the precision and control of electronics, but the acoustic sound of the piano. Over a period of eight years, he built three instruments, of which we hear the first two on the album. The third and most elaborate was a computer-controlled action for the inside of a grand piano, but before he could compose with it, his interests changed, and he moved in another direction. The first device was an adapted Marantz "Pianocorder" — an early 80s instrument that tried to be a computer-controlled player piano. The second device was a custom-made series of solenoids which could activate the keys and strings of the piano in a number of ways. [For more on these instruments, see "Computer Control for Acoustic Instruments" in *EMI* Volume VII #1, June 1991.] The first three pieces on the CD, all from 1982, are studies that show some of the capabilities of the first instrument. Although influenced by Conlon Nancarrow, they clearly show an independent voice. Alistair is not interested in speed or polyrhythm as such, but is more interested in juxtaposition and timbre. It's with "Atlantic Fears," from 1983, that the substantial music on the CD begins. In this piece the solenoids not only strike the strings at "normal musical" rates, they also strike the strings at near audio repetition rates. This produces a variety of ominous buzzing sounds. Other sounds produced by the mechanism are also exploited. Clearly, this is more than a "player piano," it's a new instrument which combines acoustic piano and mechanical sound-producing resources. The multiple arpeggios which create clouds upon clouds of resonance at the end of this piece are worth the price of the CD on their own!

"Variations for Two Instruments" from 1984 uses both pianos together. In fact, for the last part of the piece, the two instruments are playing in "unison." That is. the same control signal is going to both instruments at the same time, and they're playing together, but the different response characteristics of the instruments make some fascinating phase-shifting, rhythmic, and timbral effects. In "Black Moon Assails" (1987), the most recent piece on the CD, a much darker emotional world prevails. Again, the sound of the mechanism is used here as well as the sounds of the piano strings. By changing the duty cycle of the power supply to the solenoids, he got the solenoids to oscillate, making their own melodies, independent of any sounds they make by striking the strings. In this piece, single strikes of the strings with single notes and chords are left to resonate — the piece is as much about the aftereffects of the striking as it is about the notes themselves.

The Didkovsky-Vrtacek-MacLean CD covers some very different territory. It starts with the sound of an old upright piano being dropped 100 feet. As MacLean admits in the liner notes, the sound, as a recording, is a bit disappointing. Perhaps as with

an H-Bomb, which was for me another of those disappointing sound recordings that I expected to be amazing, you have to be there (or not, in the case of the bomb!) to appreciate it. Tomfoolery out of the way, we are then in for an hour of three different approaches to electronically extending the piano. MacLean records lots of prepared piano and piano interior sounds, samples them, and then makes dense, polyrhythmic, compelling pieces with sequencer control. There's a good balance between the prepared or interior sounds and the "normal" piano sounds, and the pieces repay repeated listening. C.W. Vrtacek uses a sequencer and a digital piano module to make textures that humans would not be able to play. His dense pieces are mostly very short. In fact a series of three 20-second pieces later in his part of the CD are exquisite miniatures. As well as the obvious Nancarrow influence, I sense the spirit of Erik Satie hovering around these happy, ostinato-based pieces. Didkovsky's pieces are explorations of algorithmic and mathematical processes he programmed in the language HMSL. They don't have to be for piano, but that was the instrumental sound he wanted to use for this exploration, so why not? Again, a computer controls a digital piano module, and the result sounds like superhuman playing on some imaginary mega-piano. But his processes allow such a wide range of tempo, texture, and gesture that the results are always fascinating. There's a real sense of romanticism and bravura in these pieces, a sense that time is being sculpted even as we listen into a series of bizarre and fantastic shapes. From the extreme density of the third piece to the extreme sparseness of the fifth and final piece, we get the sense that Didkovsky is exploring the output of his program even as we are, with surprise and delight at the extremely "musical" results. For those who aren't afraid to take their pianos metaphorically, both CDs are highly recommended.

— WB

A note from the editor: With *EMI* set to publish its last issue in just a three months, we are no longer adding new recordings to the to-be-reviewed pile. Inevitably, however, a number of new recordings relating to unusual instruments have trickled in since this policy kicked in. In lieu of proper reviews, here's a short listing providing just the essential information on a few of these too-late-for-review releases.— *BH*

:BLUMM: **ESST OBST!**

7", 33rpm record from Frank Schültges, Krossener Str. 24, 10245 Berlin, Germany

:BLUMM: **DIE FÜNFTE DENGELOPHONIE** and **TOYGROOVES**

7" 33rpm record from Dhyana Records, Bernd Spring, Carl-Schurz Strasse 29a, D-86156, Augsburg, Germany

Here are two vinyl disks from the German duo :Blumm, consisting of Frank Schültge and Harald "Sack" Ziegler. They play a variety of acoustic and electronic sound-sources, including lots of toys and found objects and unidentifiables. With these diverse timbres, they create textures and tonalities with an engaging musicality, showing a predilection for understated yet infectious grooves.

MANY AXES: **MANY AXES**

On CD from Many Axes, PO Box 924, San Pedro, CA 90733

Susan Rawcliffe, Scott Wilkinson and Brad Dutz join forces to form the trio Many Axes. Susan is known to *EMI* readers for her invaluable contributions to the magazine on pre-Columbian flutes and whistles, as well as her own utterly unique ceramic winds. Scott Wilkinson likewise is a winds player of limitless versatility, and Brad Dutz is a percussionist. Beyond the personalities of the players, much of the special character of this CD is attributable to the use of Susan's distinctive instruments throughout. This is the first recording to do justice to those instruments, and it's a real pleasure to hear. The intelligence and awareness of all three players yields a surfeit satisfying sonic blends, each one fresh and new.

BOB MARSH, MICHAEL ZERANG, JACK WRIGHT & JOHN BERNDT: **THAT NOTHING IS KNOWN: QUARTET IMPROVISATIONS**

CD on the Recorded label (Recorded 002), 2732 St. Paul St., Baltimore, MD 21218, USA; http://www.recorded.com.

This is the CD release of an improvisation session recorded live on John Corbett's "Radio DaDa" program on radio station WHPK, Chicago. The unusual instruments featured here are from quartet member and *EMI* contributor John Berndt, playing saxes, Ghazala's Incantor, Berndt's own Sporadica, self-built feedback systems, metal balls, mouth organ, music box guts, and pickups. Strange, half-understood vocals from Bob Marsh are an important part of the effect. Jack Wright plays saxophones, and Michael Zerang contributes a satisfyingly diverse array of percussion. The result is an extended sound exploration, highly abstract in nature.

FRANK PAHL: **REMOVE THE CORK**

CD from Demosaurus, c/o David Fenech, 2 rue Claude Debussey, 38100, Grenoble, France, phone +33 (0)4 76 841 666; or contact Frank Pahl, 434 Manor Dr., Ann Arbor, MI 48105, USA; email fpahl@umich.edu.

Frank Pahl makes automatophones, some of which have appeared in the "Notes from Here and There" section in *EMI*. He also makes some of his own hand-played instruments and plays a quirky assortment of standard instruments. In this CD we hear a completely Frankonian blend of euphonium, automatic marimba, whistling, banjo, marxolin, harmonium, ukulele, etc., etc. The textures are as unique as the instrumental mixes they arise from, giving rise to a refreshingly light, airy, tripping, *trippy* kind of music.

DIE PILZFREUNDE: **EXCURSION**

Hybrid CD 16. Limited edition CD. From Hybrid Music Productions, Ebelstrasse 7 D-35392 Giessen, Germany.

Here are sound explorations from the friends of the mushroom (as the group's name translates). The instruments include a hubcap array and a set of glass jar bells created by Lukas Lindenmaier and Christine Engel, which they play along with lots of toys, found percussion, and standard percussion. Frank Rühl plays an electric guitar of his own design. A variety of electronic instruments figure in as well, but all was recorded live, without overdubs or after-the-fact processing. The music is abstract, with many lovely, spacious textures, often delicate, but not without a place for fun and an understated sort of amusement. The packaging is playful and whimsical too, showing photos of the instruments coupled with photos of the players in poses of poker-faced humor.

HANS REICHEL & EROC: **THE RETURN OF ONKEL BOSKOPP**

CD from Repertoire Records, http://www.repertoire-records.com

Longtime readers of *Experimental Musical Instruments* will already be familiar with Hans Reichel, maker of extraordinary reconfigured guitars and the inimitable bowed-stick instrument

called Daxophone. In this CD Hans is joined by the German percussionist and sound engineer Eroc. As for instruments of interest, Hans Reichel's finely crafted inventions are here; so are lots of toy instruments, found objects and junk. So are a variety of folk instruments, along with the occasional mainstream conventional instrument. And there are synthesizers.

The music is often melodic. The rhythms are never heavy. There's an odd interplay between cool and corny. Quirkiness always pops in before predictability can assert itself. There are many references to familiar musical styles, sometimes with an older European popular or folk music feeling, but things never become sedentary. *Onkel Boskopp* represents a wonderful sound sensibility in the service of a wonderful musical sensibility.

SPIN 17

Quodlibet CD QLCD001. Quodlibet Recordings, POB 317, New York, NY 10009.

Under the name Spin 17, Ed Chang (electronics, clarinet, guitar, tapes, turntable) and Motoko Shimizu (voice, turntable, toys, gizmos, guitar) make some of the most inventive, and some of the funnest and funniest sounds you will have heard in quite some time. Lots of emphasis on innate sound quality; less emphasis on harmony, melody or countable rhythm; but with its playfulness and humor, the music does not have the abstract feeling often associated with pure sound exploration.

TRANSPARENCES: **MUSIVERRE**

CD from Transparences, 64, Rue Condorcet, 75009 Paris, France.

The group Transparences, under the direction of Jean-Claude Chapuis, plays glass instruments exclusively. These include both percussion and friction instruments, most of them made by Chapuis. In this new CD the group plays several pieces of early European music (Purcell and others), plus pieces from more recent composers, including several contemporary works from the group's director. The sound textures do have a lovely quality of transparency, and they work very well in these pieces based in European harmonic practice.

VOLUNTEERS COLLECTIVE: **A YEAR OF SUNDAYS**

Cassette tape #18 from Widémouth Tapes, 3809 Melwood Ave., Pittsburgh, PA 15213

This cassette contains music-makings that took place at various venues in 1997 and 98, mostly on Sundays, performed by the Volunteers Collective. The Volunteers Collective is a loose gathering of musicians, sound artists, conceptual artists and other humans, with John Berndt and/or tENTATIVELY, a cONVENIENCE often playing a central role. On side one of this tape you can hear fourteen excerpts from twelve different performances. Side two is an extended mix using material from those performances plus a couple other performances. The liner notes describe the circumstances of the various performances and then list the grand array of sound sources used: doors, tables, explosives, drums, trees, sticks, theremin, gruntings, vacuum cleaner, leaves, water, steel drum, saxes, sporadica, nuguitar, whistling, pry bar, Bertoia sculptures, ringing rocks, propane torch, toy piano, greeting card, and much more.

Also from Wi*démo*uth Tapes, too late for review: Shortly before press time we received a package of indescribably Wi*démo*uthian releases including *Speech Defect Synthesis* (a collection of speech/sound manipulations), *2 Duets* featuring tENTATIVELY, a cONVENIENCE in duets with Neil Feather and David Prentice, *Lost in Translation*, an intriguingly strange text and sound collage work from tENT with Ben Opie, and a live recording of nightly irritainment at the Schmaltzwald, a club in Berlin. In short, Wi*démo*uth continues to produce and release cassettes tapes of sound adventures the likes of which you'll find nowhere else.

PETER WHITEHEAD: **THREE BAGS FULL**

Strat CD 004, available from Strange Attractor, 455A Valencia St., San Francisco, CA 94103; http://www.healthyarts.com/

In this CD, instrument maker Peter Whitehead has gathered recordings that he created originally as soundtracks for film and dance performances. They use a generous array of instruments of his own design, including various spike fiddles, some plucked lutes, and diverse percussion including specially mounted saw blades, diverse other cymbal- and gong-like things, spokes, springs, drums, toys, and much more. He brings in some standard instruments as well — cello from the west, suling and a few others from the east. With this idiosyncratic orchestra Peter creates a well of moody groove music, with coherent rhythms and identifiable chords and melody, couched in the intriguing textures and timbres of his distinctive instruments.

XYLOSAX: **ON THE SPOT**

CD available from Linsey Pollak, Kin Kin Rd., Kin Kin, Queensland 4571, Australia

Fun, lively, rhythmic music from instrument maker Linsey Pollak and his group. (For information on Linsey's wind and non-wind instruments, representing a unique blend of study and discipline with whimsy and humor, see his article in *EMI* Volume 14 #2, December 1998.) Many of the tracks here pair a xylophone (the Humarimba) with sax or other sax-like winds. Linsey's signature bagpipes can also be heard, along with lots of drums, some slap-tubes and more.

VARIOUS ARTISTS: HARBOUR SYMPHONY: **MUSIC FOR SHIPS' HORNS**

CD from Sound Art Initiatives, Inc., PO Box 23232, St. John's, Newfoundland, Canada A1B 4J9; email soundart@nfld.com; www.wordplay.com/SoundSym/welcome.html.

In alternate years since 1983, Don Wherry and others have worked to put together the Sound Symposium sound-art festival in St. John's, Newfoundland. At every Sound Symposium since that first one, the "signature fanfare" of the event has been the Harbour Symphony — one or more compositions created for the horns of ships in the St. John's harbor. Over the years, many different composers have contributed scores for the event. Seven of the Harbour Symphonies from recent years are gathered on this CD. What is most effective about this CD — though it couldn't be as good as being there — is the sense of the spatial expanse: the soft fullness of big sounds heard from great distance; the dispersal of the sound sources in the stereo field; the long, gentle, deliberateness of the reverberations from the hills that surround the harbor.

The next Sound Symposium, by the way, will be in the year 2000, and I'm told it will have a strong experimental instruments theme. You can write for information to the address above.

Recent Articles in Other Periodicals

The following is a list of selected articles relating to musical instruments which have appeared recently in other publications.

"The Musical Acoustics Research Library" by Gary P. Scavone in *CAS Journal* Vol. 3, No. 6 (Series II), November 1998 (112 Essex Ave., Montclair, NJ 07042-4121)

A report on MARL, the Musical Acoustics Research Library, an archive of resource materials headquartered at Stanford University. The library houses the archives of the Catgut Acoustical Society, plus the collected papers of leading acousticians Arthur H. Benade, John Backus, and John W. Coltman. The website address is http://www-ccrma.stanford.edu/ccrma/collections/marl/.

"The Changeable Harpsichord" by Christopher Stevens, in *FoMRHI* Quarterly #93, October 1998 (Fellowship of Makers and Researchers of Historical Instruments, 171 Iffley Rd., Oxford OX4 1EL, England)

A report on a harpsichord commissioned by the British theoretician Robert Smith (1689-1768), and the author's contemporary recreation of it. The instrument has a special mechanism involving handstops making alternatively tuned sharps and flats available for a total of twenty pitches per octave.

"Blue Man Group: The Off-Broadway Sensation's First Record" in *Mix* December 1998, Volume 22 #12 (6400 Hollis St., Suite 12, Emeryville, CA 94608)

The Blue Man Group makes the most of a variety of unconventional instruments, with an emphasis on PVC slap tubes, in their successful off-Broadway stage show. This article discusses the group from the point of view of the sound engineer: how to mic and record these oddities?

"Museum Acquires Rare Viennese Orphica: An Instrument 'For the Night, for Friendship, for Love'" by John Koster, in *America's Shrine to Music Museum Newsletter* Volume XXV #4 (414 E. Clark St., Vermillion, SD 57069-2390).

The orphica was a very small portable piano produced in the late 18th century. This article describes such an instrument recently acquired by the Shrine to Music Museum, and the culture that gave rise to it.

"Strings. Pedals. Action," in *Harp Today*, Fall 1998, Vol. 3 (Lyon & Healy and Salvi Publications, 168 North Ogden Ave., Chicago, IL 60607)

History and mechanics of pedal actions in chromatic harps by the Lyon & Healy and Salvi companies.

"Sources: Plans" edited by Cyndy Burton, in *American Lutherie* #56, Winter 1998 (822 South Park Ave., Tacoma, WA 98408)

A what's-available and where-to-get-it listing of plans for a wide variety of string instruments.

"Pendulum-based instruments, percussive video, sound art, and the permanence of ephemeral public art" by Dan Senn, in *Organized Sound* 2(3), 1997 (Cambridge, England)

Sound sculptor Dan Senn describes several of his sound installations. They use interactive systems often involving pendulums and other means of motion, electro-mechanical feedback systems, and, frequently, functionally integrated video displays.

"Beneath AM-FM, Sounds of Silence" by Neil Strauss, in *The New York Times* Oct 4, 1998.

A report on Stephen McGreevy's work with "natural radio" — naturally occurring electromagnetic radiation which can be converted to audible sound by means of a very-low-frequency radio receiver. Mcgreevy has released a CD of such sounds (*Electric Enigma*, Irdial Discs, email irdial@irdialsys.win-uk.net, or http://www.ibmpcug.co.uk/~irdial/vlf.htm), and also sells a vlf receiver (vlfradio@triax.com).

"The 'New' Evans Drumhead Company" and "Innovation without Gimmicks ... the Mapex Approach" (authors not credited) in *The Music Trades*, November 1998 (PO Box 432, Englewood, NJ 07631)

The Evans Drumhead manufacturing company, a pioneer in the use of synthetic materials for drumheads but not a sales leader in recent years, has recently been purchased by the musical string manufacturer D'Addario. The first of these two articles describes how D'Addario has brought the up-to-date computer-aided manufacturing techniques they use in string making to the making of the drumheads.

The second article discusses manufacturing methods for the drums themselves, as practiced at the Mapex drum company.

"Sweet Song of the Harp" in *Newsletter of the American Musical Instrument Society* Volume 27 #3, Oct. 1998 (48-21 Glenwood St., Little Neck, NY 11362)

A profile of harp maker Carl Pratt.

"How Do We Know What Mersenne Said About the Viol?" by Michael Fleming, also in *AMIS Newsletter* (address above).

A discussion of the textual ambiguities that arise in translations of Marin Mersenne's *Harmonie Universelle*, one of the essential sources on early European musical instruments.

Journal of the American Musical Instrument Society Volume XXIV, 1998 (4023 Lucerne Dr., Huntsville, AL 35802 USA) features major articles on early pianos, flutes and violoncello da spalla, as well as a spate of new book reviews and other business.

More and more communications are happening online these days, and the online stuff about musical instruments does not find its way into this "Recent Articles" listing. In addition to countless new web sites cropping up every day, two good and very active venues for online communications about musical instruments are the Musicians and Instrument Makers Forum on the web at http://www.mimf.com, and the oddmusic email list, which you can check out by going to http://www.onelist.com.